Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental Consultancy
LLP

Partnership No: OC 300776

FORMER TETROSYL WORKS, BEVIS GREEN, BURY

CONTROLLED WATERS RISK ASSESSMENT

For: Barratt Homes Manchester

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CONTENTS

1. Introduction
2. Site Characterisation
3. Conceptual Site Model and Quantitative Risk Assessment Approach
4. Derivation of Soil and Groundwater Criteria
5. Conclusions and Recommendations

DRAWINGS

001 Groundwater Plume Cores Spring 2021

APPENDICES

A RTW Input Values
B RTW Worksheets
C Comparison RTVs with Site Investigation Data

1. Introduction

1.1 Remediation earthworks to prepare the former Tetrosyl Works, Bevis Green, Bury site for residential development are being undertaken by Urban Regen Ltd. (URL) on behalf of Barratt Homes Manchester (BHM). Smith Grant LLP (SGP) has been appointed to prepare a Remediation Strategy, to undertake further investigations and monitoring, and to validate the remedial works carried out on the site.

Table 1.1: Site Details

Address	Bevis Green Works, Mill Road, Bury BL9 6RE
National Grid Reference	380950, 413950
Local Authority	Bury Metropolitan Borough Council (BMBC)
Site Area	~10.4 ha
Previous Use of Site	Office, warehouse, solvent recovery farm and packaging operations for chemical products used in vehicle maintenance. Remediation and preparatory earthworks currently ongoing.
Planning Reference:	63533
Proposed Use	Residential development with associated car parking, infrastructure and open spaces.

Figure 1.1: Site Location



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1.2 Following the production of various Stage 1 & 2 Investigations and a Remediation Strategy for the site by several third parties, an Outline Remediation Strategy (ref: 2174-R01-v2; May 2019) was prepared by SGP and submitted to Bury Metropolitan Borough Council (BMBC) and the Environment Agency (EA), together with proposals for additional site investigation works. Both Regulators have acknowledged the general approach and reiterated the requirement for further investigations and better characterisation of the risks associated with

the site before the Strategy could be approved site-wide. The further investigations required related to issues concerning the management of risks to human health from ground gas and VOC vapours, and the protection of Controlled Waters.

1.3 Several phased supplementary site investigation and groundwater investigation reports intended to address regulatory concerns regarding the delineation and characterisation of contamination at the site have since been produced by SGP. In particular the results from the following reports have provided detail on the significant pollutants present and their distribution within soil and groundwater at the site:

- Phase 1 Supplementary Groundwater Investigation (Ref: R2174c-R03-V1, Date: October 2020);
- Phase 2 Supplementary Site Investigations carried out to characterise the major identified potential pollution sources (Ref: R2174-R06-V1, Date April 2021);
- Phase 2 Supplementary Groundwater Investigation No 2. (Ref: R2174c-R09-V1, Date June 2021).

1.4 The following assessment references the findings of the above reports, and these should be read before consideration of the following risk assessment to provide context, as the findings underpin the selection of contaminants of concern, the conceptual model for the site and method used to derive the Remediation Criteria.

2. Site Characterisation

2.1. Setting, History, Geology, Hydrogeology and Hydrology

2.1.1. The site is located in the northern part of Bury, Greater Manchester, occupying the valley of a tributary to Pig Lee Brook. The site topography slopes from approximately 154m AOD in the north to 139m AOD at the site boundary in the southwest. The surrounding land use comprises a mixture of residential development to the west and south, industrial / commercial units to the southeast, and agricultural land to the east and north (the M66 motorway is located in close proximity to the north of the site).

2.1.2. During the site's historical development prior to 1844, a tributary of Pig Lee Brook which previously flowed through the site was dammed to form a reservoir in the centre-east, originally discharging to two smaller reservoirs to the south and a culvert below the southeast part of the site. These reservoirs facilitated the original known development of the site, the Bentley and Lumn Cotton Mills.

2.1.3. By 1890 a change to the use of the site had occurred, referred to in the mapping as 'Lumn Mills (Cotton & Logwood dyes)', and the main reservoir is shown to have significantly expanded northwards; a new earth-retained reservoir is also indicated in the southwest. The usage of the site changed again to the 'Bevis Green Print Works' by 1928, with a rock quarry also indicated in the centre-north of the site to the west of the main reservoir. By the mid-1960s, Tetrosyl had acquired and further developed the site as a 'Car Accessories Factory' which latterly included a solvent bulk storage and recovery plant in the centre-northwest adjacent to the remaining reservoir.

2.1.4. With the exception of the main reservoir in the northeast of the site, all of the onsite reservoirs have now been drained and infilled. The discharge from the main reservoir occurs solely via a culvert from the south side of the dam flowing through the site to the outlet in the valley 145m to the southwest. The industrial use of the site finally ceased in late 2019, since which time a programme of demolition works and remediation earthworks in the Phase 1 part of the site has been implemented to prepare the site for redevelopment to housing.

2.1.5. BGS mapping indicates superficial deposits of Glacial Till (Boulder Clay) across the site which have been confirmed at various locations, although site investigation information has shown this exists as a thin layer, typically less than 2m thick, whilst being completely absent across large parts of the site, likely as a result of the previous development. At these locations the underlying Rough Rock sandstone unit outcrops. The Rough Rock thins to the south and southwest and is absent from the most south-easterly parts of the site, where the mudstones of the underlying Rossendale Formation outcrop.

2.1.6. The presence of made ground has also been confirmed across the developed parts of the site during the various phases of site investigation, with only a thin veneer of hardcore noted in the

northwest in the northern, undeveloped part of the site. The depths of made ground have been shown to be variable generally extending down to 2-3m bgl in the central and southern sectors, with a maximum proven depth of 11m in the southwest, representing infill to the original Pig Lee Brook Valley landform.

2.1.7. The site topography falls from around 153m AOD in the north to 136m AOD in the far south of the site, the substantial drops in levels being across the reservoir dam in the east and over a series of large retaining structures to the west.

2.1.8. Groundwater levels fall across the site in general accordance with the natural topography. In the northern areas, groundwater is present at, or near to the top of the Rough Rock and a gradient down to the southwest is apparent over most of the central and western parts of the site. The situation in the east of the site is less clear as supplementary monitoring has not extended to these areas yet, however groundwater flows here are likely to be influenced by the presence of the reservoir, dam and culverted watercourse. The culvert appears to be in hydrological continuity with the local groundwater and to serve as a groundwater drain. The Rough Rock is classified by the Environment Agency as a Secondary A Aquifer, potentially important for local water supply or providing baseflow to surface streams.

2.1.9. In the southernmost parts for the site which have been subject to several rounds of groundwater monitoring, groundwater levels appear to follow the original valley profile, with the levels concordant with the culvert invert levels and therefore probably providing baseflow to the culverted watercourse which discharges some 200m from the site boundary in a steep valley to the southwest.

2.1.10. While the shallow groundwater in the Rough Rock is considered likely to be in hydraulic continuity with the deeper strata of the Rossendale Formation, these are represented locally by shales and mudstones. Given the almost exclusive presence of light non-aqueous phase liquids as the primary pollution sources on the site (see below), impacts to groundwater bodies other than the Rough Rock aquifer are considered unlikely.

2.1.11. Glycols (antifreeze chemicals) have been detected at low levels (below drinking water standards) at the culvert outfall 200m for the site boundary. It is proposed that the reservoir surface water outflow will remain culverted in the southern part of the site and eastward diversion of the upper part of the watercourse is intended, which may reduce the likelihood of leaching from the contaminated parts of the site currently causing impacts.

2.1.12. Indicative cross sections, including interpolated groundwater gradients from the most recent monitoring in Spring 2021 are provided in Appendix C.

2.2. Potential Contaminant Sources and Controlled Waters Impacts

2.2.1. Previous site investigations carried out on the site, and semi-quantitative controlled waters risk assessment (by comparison of groundwater concentrations to Environmental Quality or Drinking Water Standards) identified high concentrations of volatile hydrocarbons in both soil and groundwater in some parts of the site. The largest storage tanks were all in the north of the site at HS10 & HS11, which also contained a solvent recovery plant and the filling points where the large tanks were emptied into smaller containers for transport to the process areas.

2.2.2. The hydrocarbons included aliphatic and aromatic compounds, with concentrations of toluene, ethylbenzene and xylene being the highest of specific indicator compounds (benzene is present as a minor constituent). This is consistent with the anecdotal evidence and records of historical inspections that, by volume, white spirit and other light petroleum distillates were the dominant classes of substances used and stored on the site.

2.2.3. Investigations and monitoring to date have found infrequent (localised) and/or relatively minor exceedances of generic standards for most other organic pollutants. The exception to the dominance of light distillate hydrocarbons is in source hot-spots HS6 and HS1; these contained tanks used to store a range of substances including the chlorinated hydrocarbon dichloromethane (DCM) and antifreeze glycols.

2.2.4. DCM was not detected at high concentration in soil samples collected from HS6, however high concentrations of the plasticizer dimethyl phthalate were reported in soils, that may be indicative of free product. Groundwater monitoring has not yet been carried out locally to this location due to access constraints, but this substance will be considered to be a potential contaminant of concern in respect of groundwater pollution.

2.2.5. Chlorofluorocarbons (CFCs) have been detected in several groundwater locations but no soil source has been identified, and they appear to represent a dispersed plume in the central part of the site whose maximum concentration does not exceed the adopted Tier 1 threshold value. Other halogenated solvents have been detected but at significantly lower concentrations, with evidence of natural attenuation occurring.

2.2.6. Glycols are also present in the groundwater but at relatively low concentrations and significantly below the adopted Tier 2 criteria.

2.2.7. Many of the other substances detected are likely to be either impurities in the original source chemicals, breakdown products formed since discharge or releases or smaller volumes of additives (fragrances, colourants, etc) used in formulating the products manufactured on the site. These have been assessed as secondary constituents to the major hydrocarbon contaminant plumes or dispersed or localised impacts.

2.2.8. SGP had assessed that hydrocarbon impacts to the Secondary A Aquifer underlying the site were present, and that this was in turn acting as a migration pathway, although concentrations

of pollutants in the downstream watercourse were undetectable with the exception of traces of glycols.

2.2.9. SGP proposed in the Outline Remediation Strategy that remediation was required to address the source of the groundwater impacts by the following methods:

- removal of any residual primary sources of pollution in tanks and drums,
- physical excavation of secondary sources of free product and contaminated soils for disposal or treatment,
- in situ treatment of groundwater and bedrock if necessary to reduce residual concentrations to acceptable levels.

2.2.10. This assessment and proposals was accepted by the Environment Agency who required that further works to delineate the extent of the impacted materials take place and that further risk assessment should be carried out before a more detailed Remediation Strategy, including site-specific Remediation Criteria for the protection of Controlled Waters, can be developed.

2.3. Application of Risk Assessment to Remedial Target Development

2.3.1. It is a requirement that the Quantitative Risk Assessment (QRA) used to develop Remedial Target Values (RTVs) is protective of all Controlled Waters Receptors and relevant for all of the linkages discussed above. This will require certain conservative assumptions to be made regarding the existence of preferential migration pathways.

2.3.2. Although the northern parts of the site are some distance upgradient of the site boundary, the central parts of the site are relatively close to the culverted watercourse and significant groundwater impacts near the site southern boundary have been confirmed.

2.3.3. For the purposes of defining a receptor and predicting future impacts, although the groundwater within the site is unlikely to form a potential future resource, definition of a compliance point within the site, rather than at some arbitrary distance off-site, is considered appropriate for the most impacted areas.

2.3.4. It is therefore considered appropriate to develop Remediation Criteria for both soil and groundwater at the site. These should be protective of a nominal receptor point, beyond which significant groundwater impacts (exceedances of Tier 1 criteria) are undesirable.

2.3.5. Wherever possible, site-specific information should be used to derive Remediation Criteria; alternatively authoritative published criteria may be used providing consideration is given to the range of available values and the selection of specific values is justified, particularly where these have a proportionately large influence on the outcome of the assessment.

2.3.6. The derived Remediation Criteria can be used to define areas where remediation to protect controlled waters is required (by comparison with site investigation data) and assess the

adequacy of future works undertaken to reduce non-polluting source concentrations (by comparison to verification data).

3. Conceptual Model and Quantitative Risk Assessment Approach

3.1. Methodology

3.1.1. Information from the site investigations has been used to supplement the data acquired in the desk study and refine the assessment of likely source-pathway-target relationships that may exist at the site during and following the proposed development. Principal factors that may determine potential sources of contamination at the site, receptor vulnerability and potential pathways before and after development have been identified and each assessed in turn to revise the Conceptual Site Model (CSM).

3.1.2. The method for generating the Remedial Target Values (RTVs) is the EA Hydrogeological Risk Assessment for Land Contamination: Remedial Targets Worksheet V3.2 2013 (RTW). The model assesses impacts at three tiers; the initial partitioning of contaminants from the soil matrix in the unsaturated zone into porewater (Tier 1), dilution by infiltration on entering the aquifer (Tier 2), and attenuation by adsorption to organic matter and degradation between the release point at the source and a receptor (Tier 3). The results can be compared soil and groundwater concentrations to determine the likelihood of impacts (exceedances of the tier 1 criteria) at receptors at various distances form the source zones.

3.1.3. The model cannot assess impacts from free product. The requirement for removal of all substantial free phase hydrocarbon from primary sources remains a core part of the Outline Remediation Strategy. However, the assessment of both dissolved phase substances in groundwater and residual soil-adsorbed contamination is acceptable, and the results may therefore be applied to residual made ground replaced during the works, treated soils under consideration for replacement and the residual groundwater within source zones following implementation of the source reduction exercises, specified under the Outline Remediation Strategy.

3.2. Contaminant Sources

3.2.1. For hydrocarbons and associated organic compounds there are confirmed secondary sources in the northern, central and southern parts of Phase 2. Heavily contaminated soils present on the site and recorded concentrations in dissolved phase in ground and surface waters indicate that historical migration has occurred, but that the plume within the Rough Rock aquifer associated with the former solvent storage and use areas in the north of the site can be delimited, and that concentrations reduce with distance from the former sources down-gradient. Given the length of time since the primary sources were removed it is considered likely that the detected plume is either stable or receding.

3.2.2. Light petroleum distillate (aliphatic and aromatic hydrocarbons) dominates with relatively few impacts from hydrocarbons heavier than C16. Typically these hydrocarbon fractions are the

most soluble and mobile substances. The projected extent of the hydrocarbon contaminated zones within the northern and central parts of the development area is indicated on Drawing 001. There is some level of uncertainty with respect to the extent of groundwater pollution in the central areas, which have remained inaccessible for the installation of monitoring/sampling installations, but the extent of the source areas in the north and south are well defined.

3.2.3. The QRA and derivation of Remediation Targets should therefore be for all of the banded hydrocarbon fractions, up to C16 carbon banding (concentrations at carbon banding above this above this are not significant in the groundwater). While EQS are only available for total hydrocarbons under the Drinking Water Standard, the BTEX indicator substances should also be considered individually.

3.2.4. Significant potential sources of glycols remain present. As groundwater impacts are relatively minor, with low groundwater concentrations in comparison to the Tier 1 criteria, these compounds are not considered to require the derivation of soil or groundwater Remediation Criteria.

3.2.5. Based on the very high concentrations / presence of free product of dimethyl phthalate, Remediation Criteria for this substance are also considered necessary for HS6, however groundwater monitoring and sampling in the central part of the site has not been completed to date. While the source zones and groundwater / plume characteristics in the north and south of the site are reasonably well defined, an addendum to this report will be produced following groundwater investigation to the central parts of Phase 2 when the presence/absence of other significant groundwater pollution in these areas has been clarified.

3.2.6. While it is known that certain chlorinated solvents were used and stored on the site, and groundwater concentrations above the adopted DWS/EQS have been reported, these concentrations are several orders of magnitude less than the unsubstituted hydrocarbons present, with total concentrations in the 10's or low 100's µg/l. The distribution of breakdown products may also indicate that natural attenuation is taking place, with vinyl chloride by far the most widespread chlorinated substance but present at low concentrations.

3.2.7. The exception to this is the CFC dichlorodifluoromethane (Freon 12). This is present at a maximum concentration of 2,000 µg/l but appears to be confined to the northern and central parts of the site. The CFC would be expected to strongly partition to vapour phase on discharge to the surface, so does not pose a risk of pollution to surface waters. This CFC has low environmental toxicity, and a UK environmental standard is not available; the Danish Drinking Water Standard adopted was not exceeded.

3.2.8. Other substances have been detected in soil samples collected from the various hotspots but at relatively low concentrations and assessed as forming minor constituents of the main hydrocarbon groundwater plumes in the groundwater analysis completed to date.

3.3. Receptors

3.3.1. The receptors with respect to pollution of controlled waters are the Secondary A Aquifer within the Rough Rock sandstone, and the culverted surface watercourse Pig Lee Brook.

3.3.2. Direct assessment of impacts in the Secondary 'A' Aquifer is possible using the RTW; the Tier 3 assessment can be used to assess impacts at a selected compliance point at an appropriate distance from the source. For the purposes of this assessment, where the distance between the sources and the receptors vary considerably (either the culverted Pig Lee Brook, or the extension of the Rough Rock Aquifer beyond the site boundary), selection of a conservative distance to compliance point for groundwater migration is appropriate.

3.3.3. The RTW is not directly applicable for the assessment of the other receptors; the culverted surface watercourse which crosses the site and discharges some 200m to the southwest. However, if the basic, and highly conservative assumption that further attenuation between the Secondary 'A' Aquifer and these receptors does not take place (for example dilution on entering the surface watercourse), then adoption of an appropriate compliance point within the Tier Three assessment can be used to rule out likely impacts.

3.4. Pathways & Model Input Values

3.4.1. The contaminants of concern identified on the site are exclusively Light Non-Aqueous Phase Liquids (LNAPL) which, if present as free product, would tend to float on top of the groundwater presenting a reservoir of pollutant at shallow depth. The substantial removal of these, and disposal off-site is a key remediation objective leaving only hydrocarbons adsorbed to soils or in dissolved phase in pore water and groundwater. It is intended that heavily impacted soils are also removed for treatment to allow their re-use within the site. Both the residual soils and the retained treated soils could continue to leach hydrocarbons to the dissolved phase in soil pore water which may migrate into the Secondary 'A' Aquifer.

3.4.2. Normally a nominal 50m compliance point downgradient of the source site boundary would be selected to protect the aquifer when the hazardous substance is already in the groundwater or the groundwater has a strategic resource potential. For the particular scenario under consideration the 50m compliance point for the Secondary 'A' Aquifer is assumed to be 50m downgradient of the source within the site, rather than from the site boundary.

3.4.3. The distance between the northern source area and the central/north monitoring wells is approximately 50m. These wells are directly downgradient and groundwater concentrations have been established, therefore this information should allow for calibration of the model with respect to the predicted concentrations at the receptor.

3.4.4. 50m is also the approximate distance from the central contamination hotspot (HS6) and the planned realignment of the surface watercourse. Adoption of a 50m compliance point for sources closer to the site boundary (the USTs in the south on the site, for example) also

allows prediction as to whether residual contamination at the site boundary which cannot be directly removed through source excavation is likely to extend significantly downgradient into the valley, and potentially impact the watercourse off the site.

3.4.5. This approach pre-supposes that preferential migration pathways into the surface watercourse will not exist following development.

3.4.6. Other construction / development-stage activities that have the potential to alter the hydrological/hydrogeological regime at the site are the implementation of a Sustainable Urban Drainage System (SUDS) to attenuate surface water discharge form the site in times of high rainfall, and the diversion of Pig Lee Brook along the eastern site boundary before it enters the retained section of the culvert that crosses the southernmost part of the site. The SUDS area constructed to date is in an area of Phase 1 with no groundwater impacts, and the diversion/daylighting of the culvert will move the upper parts of this receptor further away from contaminant sources (although the lower section will remain near to HS1).

3.4.7. The potential source-pathway-target target relationships which either exist already (and will remain following completion of remediation works), or may be introduced, by the remediation / construction works are summarised in the following table, together with commentary on the likelihood of significant pollution based on site/method specific factors and identification of the level of RTW assessment appropriate for generation of RTVs for residual / treated soils on the site.

Table 3.1: Conceptual Site Model for Controlled Waters

Source / Contaminant	Receptor	Pathway	Commentary	Appropriate RTV tier
Adsorbed hydrocarbons in residual made ground following excavations to remove free product and grossly contaminated soils, or in treated soils following treatment to reduce total concentrations & dissolved phase hydrocarbons in groundwater	Secondary 'A' Aquifer in Rough Rock Sandstone	Leaching and infiltration to groundwater and migration to south down hydraulic gradient to nominal compliance point in accordance with standard practice for resource protection	The 50m default compliance point from the site boundary has been rejected and an alternative point 50m from the source zone approximately intersects with the site boundary	**Tier 3 (compliance point 50m from source)**
	Surface Water in on-site culvert and downstream watercourse	Migration of dissolved phase contamination down hydrogeological gradient Secondary 'A' Aquifer until local influence of open surface water drains at site periphery or covered/relict historical drain within site causes groundwater to discharge to surface waters	The 50m default compliance point intersects with both culvert location relative to a number of the contaminant s sources, outside the site the culvert discharges at a distance closer to 200m	**Tier 3 (compliance point 50m from source)**

4. Updated Soil and Water Criteria: Controlled Waters

4.1. Conceptual Site Model and RTW Parameters

4.1.1. The criteria for the protection of controlled waters are derived using the EA Hydrogeological Risk Assessment for Land Contamination V3.2 2013 (RTW). All three tiers of soils assessment, and the tier 3 groundwater assessment have been completed using the available site data. Where site-specific data is not available, certain conservative assumptions have been made. It is intended that the criteria be used to assess both residual materials left in-situ following the planned excavation of unacceptably contaminated soils (and free product), and also for any treated materials to assess their potential for retention within the site/confirm recovery under the site MMP.

4.1.2. No EQS are available for several of the substances under consideration. The Drinking Water Standard adopted for comparison of total hydrocarbon concentrations may be somewhat conservative, however, as the additive effect of all of the fractions present may result in an overall higher concentration at the receptor, selection of this as a target value for each individual fraction may be considered an appropriately conservative approach. If the receptor concentrations of individual fractions do not exceed an inherently conservative criterion then the additive concentrations are unlikely to cause any significant pollution, particularly where the receptor is not a drinking water resource.

4.1.3. The adopted physiochemical characteristics of the substances under consideration are those published in authoritative guidance on the derivation of various generic assessment criteria for human health. A discussion of the selection process for the parameters of contaminant, soil, groundwater and receptor are provided below whilst values and their justification / source are referenced within Appendix A.

4.1.4. The first tier of assessment examines partition to pore water within the impacted soils, to calculate the contaminant partitioning, the density of the impacted soils and their water and air-filled porosity are required. Based on the existing Remediation Strategy requirement for all site fills to be exposed and inspected, and for removal of the impacted soils down to rockhead where this is above the water table, the characteristics of the upper weathered Rough Rock have been used. The average Soil Organic Matter determined during the site investigations was 1<%, in the clean sandstone tested during investigation, although it is known that shale partings, coal and seat earths also form part of the sedimentary sequence underlying the site, and that these are likely to contain higher levels of organic matter.

4.1.5. For the purposes of providing representative dimensions for the body of impacted material the approximate length (100m) and width (30m) of the largest northern hotspot plume area (Area: 2,000m2) used. The default down-gradient distance of the edge of the contaminated source

area to the culverted surface watercourse at the site and the default compliance point for hazardous substances in aquifers is 50m.

4.1.6. The hydraulic gradient, background concentrations, density and porosity of the aquifer materials are all based on the available site investigation data for the site. Library values have been used for the infiltration rate (MET Office data for Rochdale).

4.1.7. As a starting point, the highly conservative assumption that degradation does not occur in the aquifer was adopted. This is very unlikely to represent on-site conditions as the light hydrocarbons which make up the main contaminants mass are fairly readily degraded, especially in the presence of oxygen. The use of library values in estimating site-specific degradation rates can be problematic given the large range of rates.

4.1.8. Assessment as to whether this approach is unnecessarily conservative has been carried out by comparison of the predicted groundwater concentrations at the receptor with the actual measured concentrations down-gradient obtained during groundwater sampling. Toluene was selected as one of the primary pollutants present for the assessment of degradation, with a relatively authoritative references for literature values. Toluene has a reported half-life of 5-500 days in various field settings and as high as 1-2 days in laboratory conditions[1], or a mean value of 12 days in anaerobic aquifer conditions[2].

4.1.9. The modelled decrease in toluene concentrations over an approximate 50m distance from the source zone with the highest concentrations RBH319/RBH320 at 175 mg/l, to those downgradient boreholes RBH306, RBH307, RBH314, RBH315, based purely on dilution, dispersion and attenuation by adsorption to aquifer matrix is compared below to various degradation rates.

Table 4.1: Comparison of Predicted Toluene Concentrations at 50m receptor with measured concentrations

Half Life for degradation of Contaminant in Water(days)	Source	Predicted Receptor Groundwater Concentration (µg/l)	Measured Range of Receptor Groundwater Concentrations (µg/l)
$9x10^{99}$	Default – zero breakdown	58,600	<5
238	Lower Field range USGS[1]	41,900	
12	Average Anaerobic EA[2]	534	
4	Value selected to result in approximate measured concentrations 50m downgradient	6	
2	Upper Lab range USGS[1]	0.007	

[1] USGS Open File Report 2006-1338 Description, Properties & Degradation of Selected Volatile Organic Compounds in Groundwater – A Review of Selected Literature.
[2] EA Draft Technical Report P5-079/TR1 Review of Fate & Transport of Selected Contaminants in the Soil Environment

4.1.10. In reality degradation rates probably vary significantly within the dissolved contaminant mass, with much slower rates within the plume core where anaerobic conditions and depleted electron donors would be anticipated (and as is evidenced by the persistence of the high concentrations and presence of anaerobic breakdown products), and higher rates downgradient at the plume fringe where more benign conditions would be anticipated. It is of note that in-situ redox potential measurements in the last monitoring carried out in the area being modelled were in the order of + 100-300 mv in RBH314 & 315 compared to -100 mv in the source zone, although this presents only a very basic measurement of geochemical conditions.

4.1.11. This being the case, the adoption of a moderately conservative average values for degradation is deemed appropriate to take account of demonstrable attenuation processes which are occurring in the groundwater without being unrealistically optimistic. Given the various lines of evidence it is considered prudent to select values that are within the upper ranges for anaerobic degradation from the available literature. These are available for BTEX as average degradation rate constants2 in groundwater which are converted to half-lives and reduced by a factor of three to account for the site-specific conditions reflected in Table 4.1 (xylene values are for meta/& para xylenes as these dominate).

4.1.12. Published half-lives for carbon range bands are not widely available therefore the approach of using indicator compounds has been pursued[3]. In general, based on the VOC and TIC analysis, the bulk of the hydrocarbon contaminant mass is made of C5-C10 Aliphatic and C7-C10 Aromatics, which could be expected to degrade in a similar manner to BTEX compounds.

4.1.13. For longer chain substances, the lightest PAHs of equivalent carbon range are used, although this is considered a conservative approach as most of the substances detected are single ring compounds with increasingly longer chain aliphatic substitutions at various positions on a single ring. The published rates are for degradation in soils, so the upper range has been used, again with the half-life corrected for the apparent increase in degradation rates measured between the plume core and downstream monitoring positions in the northern part of the site.

Table 4.1: Selected average degradation rates

Pollutant	Source	Mean Rate Constant (Day-1)	Mean Half Life (Days)	Corrected Half Life (Days)
Benzene	Average Anaerobic BTEX value (EA[2])	0.003	231	77
Ethylbenzene		0.015	46	15
Toluene		0.059	12	4
Xylenes		0.016	43	14

[3] CLAIRE Petroleum Hydrocarbon Guidance - final version1.1.pdf

Pollutant	Source	Mean Rate Constant (Day-1)	Mean Half Life (Days)	Corrected Half Life (Days)
C5-C6	Xylene as Surrogate EA[2]	0.016	43	14
C6-C8	Xylene as Surrogate EA[2]	0.016	43	14
C8- C10	Xylene as Surrogate EA[2]	0.016	43	14
C10-C12	Naphthalene as Surrogate EA[2]	0.017	41	14
C12-C16	Acenaphthene as Surrogate EA[2]	0.0055	125	41

4.2. Results

4.2.1. The criteria for the protection of controlled waters are derived using the EA Hydrogeological Risk Assessment for Land Contamination V3.2 2013 (RTW). All three tiers of soils assessment, and the tier 3 groundwater assessment have been completed using the available site data. The input and output worksheets generated by the model are provided in Appendix B.

4.2.2. Further assessments may be required for other substances and scenarios, specifically the central site hotspots which have not had local groundwater assessments completed, however the following criteria are applicable to the main northern hotspot area, and protective for the southern hotspots as have been derived using a mix of site-specific and moderately conservative literature values and a nominal 50m compliance point.

Table 4.2 RTW Assessment Results

Contaminant	Tier 1 Targets		Tier 3 Targets	
	Soil (mg/kg)	*Groundwater (mg/l)*	*Soil (mg/kg)*	*Groundwater (mg/l)*
Benzene	0.014	0.010	0.088	0.080
Toluene	0.151	0.074	1,220	6,200
Ethylbenzene	0.130	0.030	7.40	4.71
Xylene (Total)	0.141	0.030	9.56	5.86
Aliphatic (C5-C6)	13.2	1.5	895	293
Aliphatic (C6-C8)	55.4	1.5	3760	293
Aliphatic (C8-C10)	84.9	0.3	5770	58.6
Aliphatic (C10-C12)	670	0.3	45,500	58.6
Aliphatic (C12-C16)	15,000	0.3	161,000	5.04
Aromatic (C5-C7)	0.014	0.010	0.088	0.080

Contaminant	Tier 1 Targets		Tier 3 Targets	
Aromatic (C7-C8)	0.151	0.074	1,220	6,200
Aromatic (C8-C10)	1.34	0.09	91.0	17.6
Aromatic (C10-C12)	2.11	0.09	144.0	17.6
Aromatic (C12-C16)	4.21	0.09	45.2	1.51

4.2.3. The Tier 3 criteria for toluene seem high, this is due to the higher breakdown rate when compared to benzene and heavier aromatics. Where groundwater criteria are the same between bands and or indicator compounds, this is due to the adoption of common representative breakdown rates; the soils targets differ because specific physiochemical parameters impacting partition are available for individual fractions.

4.2.4. It is intended that the above criteria be used to assess both residual materials left in-situ following the planned excavation of unacceptably contaminated soils (and free product), and also for any treated materials to assess their potential for retention within the site/confirm recovery under the site MMP.

4.3. QRA Results: Controlled Waters

4.3.1. The summary results spreadsheets for the Site Source Soils and Groundwater Investigations (from Supplementary Site Investigations for Phase 1 (R2174c-R02), The Phase 1 Groundwater Monitoring Report (R2174c-R03, the Phase 2 and the Phase 2 Supplementary Site Investigation (R2174c R06) & Supplementary Groundwater Investigation (R2174c-R09)) are provided in Appendix C with concentrations compared to the RTVs generated as described above.

4.3.2. For soils, exceedances of the Tier 3 RTVs were limited to Aromatic C8-C10 Hydrocarbons and BTEX. Relatively modest exceedances were noted in HS2, HS6 & HS13, and the Quarry with more substantial and widespread exceedances in HS10 & HS11.

4.3.3. It is noted the soils sampling so far covers most of the potential identified hotspots; the only exceptions being HS1, HS3 & HS8. HS1 contains known primary contaminants sources including residual products contained in Underground Storage Tanks which must be emptied and removed before soil sampling can take place; HS3 & HS8 are currently inaccessible due to the site compound and existing gradients respectively. It is intended that soil sampling will be carried out in these areas contemporaneously with the preparatory earthworks.

4.3.4. The nature and distribution of contaminants in relation to the Tier 3 RTVs is reflected in the Groundwater Data, the only exceedances to Tier 3 Criteria are for C8-C10 aromatic hydrocarbons, and BTEX. With the exception of WS311 which reported exceedances for a slightly heavier mix of C10-C16 aliphatic and aromatic hydrocarbons, these were restricted to

the boreholes around, and downgradient to HS11, the main bulk solvent storage, recovery and filling area (RBH319, RBH320, RBH321, RBH324 & RBH325).

4.3.5. It is noted the groundwater sampling so far has been restricted to the northern and southern part of the site and a number of hotpots in the central and northern areas. HS5, HS6, HS7, HS8, and HS9 still require local groundwater sampling once enabling works have progressed sufficiently to allow access for the establishment of monitoring installations. In particular groundwater sampling around HS8 must establish whether the very high phthalate concentrations encountered in this area are impacting groundwater. The levels and locations of the Tier 3 exceedances are noted in the table below:

Table 4.3 Summary of findings Potential or Known Contamination "Hot-spots"

Hotspot ref:	Feature	Exceedances of Soil RTVs	Exceedances for Groundwater RTVs	Notes & Requirements for remediation and/or further assessment
Quarry	Former rock quarry, latterly used as a refuse tip	Moderate Exceedances Tier 3 Soil Criteria for C8-C16 Aromatic compounds & BTEX	No Exceedances Tier 3 Groundwater Criteria	Ful turnover to Quarry fills not possible due to groundwater ingress, further soil removal not required
#1	Former reservoir; underground storage tanks (USTs) for white spirit, antifreeze (MEG) and methanol; above ground storage tanks (ASTs) including heating oil; antifreeze mixing area	Not sampled – Tank contents confirmed as Diesel/Kerosene, White Spirit & Glycols – Residual Primary Source	Tier 3 RTVs not exceeded in adjacent monitoring positions (RBH304 & RBH304)	Tanks require draining and removal, soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs
#2	Drum compound	1 Sample with moderate exceedance Tier 3 RTVs for Aromatic C12-C16 only	Downgradient monitoring positions at RBH302 & RBH 303 not impacted	Sampling in well within bunded area E3P RBH202 20/12217 did not indicate any impacts. Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs
#3	Fuel oil AST	Not sampled, below URL compound	Downgradient monitoring positions at RBH302 & RBH 303 not impacted	Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs
#4	Diesel AST	Only one sample obtained, no exceedances Tier 3 RTVs	Downgradient monitoring positions at RBH302 & RBH 303 not impacted	Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs
#5	Kerosene AST	Only two sample obtained no exceedances Tier 3 RTVs	Central areas – no local groundwater data	Soil sampling for comparison to RTVs removal of secondary soil sources - compare residual soil concentrations to RTVs. Groundwater monitoring and sampling required to confirm local impacts

Hotspot ref:	Feature	Exceedances of Soil RTVs	Exceedances for Groundwater RTVs	Notes & Requirements for remediation and/or further assessment
#6	ASTs for dichloromethane (DCM), white spirit, kerosene, sodium silicate and heating oil - located between former mill buildings	moderate exceedance Tier 3 RTVs for Aromatic C12-C16 only	Central areas – no local groundwater data	Very high phthalates reported in one location only. Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs. Groundwater monitoring and sampling required to confirm local impacts: Risk Assessment and Remedial Targets may be required for other pollutants, if substantially present above Tier 1 criteria in groundwater.
#7	Electrical transformer and diesel AST on side of mill building	Only one sample obtained, no exceedances Tier 3 RTVs	Central areas – no local groundwater data	Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs. Groundwater monitoring and sampling required to confirm local impacts.
#8	Disused AST (contents unknown) on lodge dam	Not sampled, cannot access	Central areas – no local groundwater data	Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs. Groundwater monitoring and sampling required to confirm local impacts.
#9	USTs infilled with concrete near boiler house	No exceedances Tier 3 RTVs	Central areas – no local groundwater data	Soil sampling for comparison to RTVs during removal of secondary soil sources -compare residual soil concentrations to RTVs. Groundwater monitoring and sampling required to confirm local impacts
#10	Solvent filling room and ASTs	Limited soil sampling but significant Tier 3 RTV exceedances recorded	Fewer exceedances to RTVs than adjacent HS11, however impacts and groundwater plume extend into HS10 and local soil sources are confirmed downgradient wells >50m not impacted	Soil sampling for comparison to RTVs during removal of secondary soil sources, maintenance monitoring wells for further monitoring and possible groundwater treatment
#11	Solvent recovery plant and tank farm (various ASTs and pipework)	Majority of samples exceed RTVs for xylene and fewer but significant exceedances RTVs for other BTEX and Aromatic C8-C16	All groundwater RTV exceedances within HS11 (RBH319, RBH320, RBH321, RBH324 & RBH325), downgradient wells >50m not impacted	Soil sampling for comparison to RTVs during removal of secondary soil sources, maintenance monitoring wells for further monitoring and possible groundwater treatment
#13	Waste sludge reclamation plant	Limited soil sampling but significant Tier 3 RTV exceedances recorded	No Tier 3 RTV exceedances recorded	Wider range of organic substances detected in this area but limited groundwater impacts Soil sampling for comparison to RTVs removal of secondary soil sources
#14	Drum crushing plant	No exceedances Tier 3 RTVs	No Tier 3 RTV exceedances recorded	Watching brief during works

4.3.6. Where maximum groundwater concentrations exceed the RTVs this is indicated in Drawing 001.

5. Conclusions & Recommendations

5.1. Conclusions

5.1.1. The risk assessment indicates that the Secondary 'A' Aquifer underlying the site has been impacted by the historic contamination by hydrocarbons (dominated by "White Spirit" or light petroleum distillate mixes of aliphatic, but mainly aromatic fractions in the C7-C12 range).

5.1.2. Adoption of a 50m compliance point down-gradient from the source area would be protective of the wider shallow aquifer and the open surface water features within the site, and risks to more distant receptors appear unlikely. The RTVs generated, based on the assessment described above, represent a balanced approach to remediation, where the potential for contamination to contribute to existing plumes of pollutants in the groundwater would be managed, but reflecting the fact that meeting tier -1 criteria for receptors is unlikely to be practicable in the source zone areas present.

5.1.3. Using these as a basis for comparison, several of the potential source zones identified contain exceedances of the Tier-3 RTV criteria; this only indicates a potential risk of a viable pollutant linkage, under the definition applied above. However remediation works in accordance with the existing Outline Remediation Strategy to remove primary sources (apparently now limited to the residual USTs in Hotspot 1) and secondary Soil Sources, where concentrations exceed the Tier 3 RTVs (confirmed in several locations) should be caried out using the soils criteria to determine the adequacy of the works. As within the existing Outline Remediation Strategy, any non-aqueous mobile hydrocarbon (free product) encountered will be deemed to be unacceptable contamination and will be removed for treatment or disposal depending upon the nature and quantity of deposit.

5.1.4. On current information there is only one area confirmed where the above approach may not be sufficient to fully remove the potential for ongoing pollutant migration; this is HS11. Here Tier 3 Groundwater RTVs are exceeded in 5 No. boreholes located adjacent to and down-gradient of the former bulk solvent storage area, solvent recovery plant and solvent filling points. It is noted that groundwater monitoring in the central parts of the site has not taken place and there is the potential for other localised sources and different pollutant suites to be present which could necessitate supplementary assessment and remediation where appropriate.

5.2. Recommendations

5.2.1. An Outline Remediation Strategy has been produced for the site which details the methods to be adopted for the identification, delineation, physical excavation, segregation and removal of unacceptably contaminated materials. This document is considered to remain appropriate for the vast majority of works to be undertaken in preparing the site for residential development and has been successfully implemented in Phase 1 to date.

5.2.2. It is intended that the RTVs determined in the above assessment be adopted to determine the requirement for the excavation of the hydrocarbon contamination sources within the site and the subsequent treatment of impacted soils to reduce contamination levels before any reuse within the site. This will be carried out by comparison of concentrations of the various fractions and indicator compounds in validation/verification samples collected under the provisions set out in the Remediation Strategy.

5.2.3. Initially this report, and the supporting site investigation reports, should be submitted to the Regulators for comment. Once suitable Remediation Criteria are agreed then these will need to be incorporated into a revised, Detailed Remediation Strategy for Phase 2 with an updated Options Appraisal containing both provision for soils treatment and, methods to address groundwater treatment, or treatment of the unsaturated part of the Rough Rock Aquifer, where residual secondary sources could remain following the preparatory earthworks.

5.3. Limitations

Stratigraphy

5.3.1. The evidence of stratigraphy is taken from discrete borehole and trial pit locations, and from factual information provided by other parties. Whilst it is usually reasonable to infer that similar conditions may extend between these locations, caution should be exercised, in particular where conflicting information has been highlighted during review of such information.

Contamination

5.3.2. The site investigation involved sampling at discrete locations, and it should be recognised that further areas or types of contamination may exist between investigation positions. The analyses performed are drawn from a typical suite of tests used to screen potentially contaminated land and specified to fall within the available budget made available for the site investigations. It is always possible that other substances may be present that have not been included within the standard range of tests.

Soil gas and groundwater

5.3.3. Any comments made on gas and/or groundwater conditions are based on observations or tests made at the time that the work was carried out. It should be noted that gas concentrations and pressures and groundwater levels and concentrations of substances may vary according to seasonal or weather-related effects, sometimes in an unpredictable fashion.

General

5.3.4. This report has been prepared by SGP for the sole and exclusive use of Urban Regen Ltd Barratt Developments PLC trading as Barratt Manchester. Reasonable skill, care and diligence has been exercised within the budget available, and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground

conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the whole report and not on extracts which may lead to incomplete or incorrect conclusions when taken out of context.

5.3.5. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

DRAWING

149.5 Monitoring Well & Groundwater Level (mAOD)

151 Interporlated Groundwater Contour (mAOD)

Groundwater plume Core: Tier 3 Groundwater RTVs Exceeded

BALDINGSTONE

WALMERSLEY OLD ROAD

RIBBLE DRIVE

BEVIS GREEN

MILL ROAD

MAIN STREET

CAMP BANK

Reservoir

Works

Tank

Cross Hall Farm

Mill House

15
WS302
WS317
151
RBH311
RBH312
RBH313
RBH328
151.2
RBH327
150.1
11
150
RBH329
149.5
RBH326
149.4
RBH323
149.9
149
WS312
RBH330
149.4
RBH325
150.2
RBH324
150.5
13
147
RBH322
148.7
WS311
146
WS310
12
11
RBH321
149.6
RBH310
RBH309
145
RBH319
149.6
RBH320
148.8
RBH318
147.5
RBH316
147.7
10
RBH317
148.9
144
RBH203
Weir overspill 148m
RBH308
RBH307
RBH306
9
RBH314
143.9
RBH315
145.9
WS320
7
Line of culvert
130
6
5
129
RB301
128.5
128
127
RB302
126.8
4
Alignment estimated from condition report
3
2
RBH202
INVERT LEVEL CULVERT 125m
INVERT LEVEL CULVERT 130m
RB303
127.3
1
RB304
131.8
RB305
131.6
8

indicative potential or actual contamination source

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Project: **Tetrosyl Bevis Green Site, Walmersley, Bury**

Drawing: **Groundwater Plume Cores Spring 2021**

Drawn:	Checked:
AFS	BJT
Date: 21.06.2021	Scale: 1:1,250 @ A3
Job No: R2174	Drg No: R10-001

APPENDIX A

RTW Input Values

Table A1 – Physical parameters for the land use at Tetrosyl, Bevis Green, Bury.

Parameter	Value	Units	Reference	Justification/Notes
Level 1				
Effective Porosity	0.368	Fraction	Calculated – Checked Against Groundwater Hydrology 2nd Edition Todd	Literature value for the effective porosity of 'medium / coarse grained sand' which best describes the residual surface material following the hotspot excavation works. Is 0.39
Water-Filled Porosity	0.263	Fraction	Calculated	Literature value for effective porosity of medium / coarse grained sand is 39% and laboratory analysis has determined the average moisture content of the residual surface material during excavation works to be 15.5%.
Air Filled Porosity	0.105	Fraction	Calculated	Literature value for effective porosity of medium / coarse grained sand is 39% and laboratory analysis has determined the average moisture content of the residual surface material during excavation works to be 15.5%.
Bulk Density of Soil Zoner Material	2.02	t/m^3	Groundwater Hydrology 2nd Edition Todd	Source assumed to be upper, weathered Rough Rock – recovered as Sand, Gravel and Cobbles Gravel – Value for Wet Density
Fraction Organic Carbon	0.0093	Fraction	Site-Specific	Experimentally determined by analysis of TOC: laboratory analysis has determined the average organic of the residual surface material during excavations works to be 0.93%
Level 2				
Infiltration	0.0031	$m.d^{-1}$	Met Office	1,118.6mm/yr (Rochdale) https://www.metoffice.gov.uk/public/weather/climate/ Assumes 100% infiltration
Area Source	2,000	m^2	R2174-R10-D01	Maximum extent of residual contamination plume extending across hotspots HS10, HS11 and HS13.
Length of Source	100	m	R2174-R08-D01	Maximum extent of residual contamination plume extending across hotspots HS10, HS11 and HS13.
Saturated Aquifer Thickness	14	m	E3P Report ref: 11-500-R1; February 2017.	12m is the maximum proven thickness of the Rough Rocks Sandstone bedrock recorded in rotary borehole RBH315
Hydraulic conductivity	1.15	$m.d^{-1}$	Calculated	Determined via the undertaking of falling head tests on multiple boreholes across the site with response zones located within the sandstone bedrock. Values ranges from $1.97x\ 10^{-6}$ m.s (Rossendale Formation) $3.09\ x10^{-5}$ m.s (Rough Rock) The average Kd value for the rough rock is $1.33\ x10^{-5}$ m.s ($1.15\ m.d^{-1}$). This is at the higher end of the typical range for sandstone (Guide to Permeability Indices, BGS open report CR/06/160N) so can be considered a conservative indicative value
Hydraulic Gradient	0.04	Fraction	Calculated	Gradient calculated from the difference in groundwater levels between the most northerly, upgradient Phase 2 borehole (RBH 326 150m AOD) and the most southerly, downgradient borehole (RBH 314 -144 AOD) in this zone, separated by a distance of 150m
Width of Contaminant source	30	m	R2174-R10-D01	Maximum extent of residual contamination plume extending across hotspots HS10, HS11 and HS13.
Background Concentration	1×10^{-4}	mg.l	Laboratory detection limit (MTBE).	0.0001 mg/l: lowest laboratory detection limit for modelled contaminants.
Mixing Zone Thickness	14	m	Saturated Aquifer thickness	12m is the maximum proven thickness of the Rough Rocks Sandstone bedrock recorded in rotary borehole RBH315

Level 3				
Bulk Density Aquifer Materials	2.35	g.cm^3	Calculated	Calculated utilising site recovered borehole samples of the Rough Rock Sandstone.
Effective Porosity	0.11	Fraction	Calculated	Density of Quartz = 2.65 g.cm^3 (https://chem.libretexts.org)
Distance to compliance point	50	m	R2174-R10-001	Distance from HS10/11/13 and downgradient monitoring points RBH314/RBH315 - also EA standard off-site impact where the hazardous substance is also in the groundwater
Time since pollutant entered groundwater	1 x 10^{100}	d	Unknown	Infinite source assumed

Table B1 – Physical-chemical and toxicological parameters for Benzene

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	SC050021 / Benzene SGV	
Target Concentration	0.01	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.116	cm^3 cm^{-3}	SC050021 / Benzene SGV	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	134.9	l.kg	SC050021 / Benzene SGV	Inverse Log of 2.13 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	0.4	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	0.5	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	77	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B2 – Physical-chemical and toxicological parameters for Ethylbenzene

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	SC050021 / Ethylbenzene SGV	
Target Concentration	0.03	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.14	cm^3 cm^{-3}	SC050021 / Ethylbenzene SGV	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	446.7	l.kg	SC050021 / Benzene SGV	Inverse Log of 2.65 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	65	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	9.7	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	15	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at

				downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B3 – Physical-chemical and toxicological parameters for Toluene

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	SC050021 / Toluene SGV	
Target Concentration	0.074	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.115	cm^3 cm^{-3}	SC050021 / Toluene SGV	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	204	l.kg	SC050021 / Toluene SGV	Inverse Log of 2.31 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	53.891	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	175.8	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	4	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B4 – Physical-chemical and toxicological parameters for Xylene

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	SC050021 / Xylene SGV	
Target Concentration	0.03	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.112	cm^3 cm^{-3}	SC050021 / Xylene SGV	Highest value of isomers: Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	489.8	l.kg	SC050021 / Xylene SGV	Lowest value of isomers Inverse Log of 2.69 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	225	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	37.8	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B5 – Physical-chemical and toxicological parameters for TPHCWG Aliphatic C5-C6

Parameter	Value	Units	Reference	Justification/Notes

Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	1.5	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	21.0	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	812.8	l.kg	S4ULs	Inverse Log of 2.91 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	9	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	2.3	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Xylene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B6 – Physical-chemical and toxicological parameters for TPHCWG Aliphatic C6-C8

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	1.5	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	27.3	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	3801.9	l.kg	S4ULs	Inverse Log of 3.58 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	368	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	45.2	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Xylene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B7 – Physical-chemical and toxicological parameters for TPHCWG Aliphatic C8-C10

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.3	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	41.5	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	30,199	l.kg	S4ULs	Inverse Log of 4.48 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	234	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	10.8	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09

Half-life for degradation	14	days	EA P5-079/TR1	Xylene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B8 – Physical-chemical and toxicological parameters for TPHCWG Aliphatic C10-C12

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.3	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	64.4	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	239,883	l.kg	S4ULs	Inverse Log of 5.38 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	1,982	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	0.5	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Naphthalene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B9 – Physical-chemical and toxicological parameters for TPHCWG Aliphatic C12-C16

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.3	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	171	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	5,370317	l.kg	S4ULs	Inverse Log of 6.73 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	616	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	0.01	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	41	days	EA P5-079/TR1	Acenaphthene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B11 – Physical-chemical and toxicological parameters for TPHCWG Aromatic C5-C7 (Benzene)

Parameter	Value	Units	Reference	Justification/Notes

Chemical type	Non-Polar Organic	NA	SC050021 / Benzene SGV	
Target Concentration	0.01	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.116	cm^3 cm^{-3}	SC050021 / Benzene SGV	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	134.9	l.kg	SC050021 / Benzene SGV	Inverse Log of 2.13 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	1	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	0.5	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	77	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B12 – Physical-chemical and toxicological parameters for TPHCWG Aromatic C7-C8 (Toluene)

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	SC050021 / Toluene SGV	
Target Concentration	0.074	mg. l^{-1}	WFD 2015	EQS See R2174C-R09
Henrys Law constant	0.115	cm^3 cm^{-3}	SC050021 / Toluene SGV	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	204.17	l.kg	SC050021 / Toluene SGV	Inverse Log of 2.31 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	817	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	175.8	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	12	days	EA P5-079/TR1	Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B13 – Physical-chemical and toxicological parameters for TPHCWG Aromatic C8-C10

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.09	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	0.253	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	1,584.9	l.kg	S4ULs	Inverse Log of 3.2 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	616	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06

Maximum Groundwater Concentration	47.5	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Xylene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B14 – Physical-chemical and toxicological parameters for TPHCWG Aromatic C10-C12

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.09	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	0.0722	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	2,511	l.kg	S4ULs	Inverse Log of 3.4 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	658	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	1.2	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	14	days	EA P5-079/TR1	Naphthalene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

Table B15 – Physical-chemical and toxicological parameters for TPHCWG Aromatic C12-C16

Parameter	Value	Units	Reference	Justification/Notes
Chemical type	Non-Polar Organic	NA	S4ULs	
Target Concentration	0.09	mg. l^{-1}	DWS	EQS See R2174C-R09
Henrys Law constant	0.0126	cm^3 cm^{-3}	S4ULs	Referred to as Air-water partition coefficient (K_{AW}) in reference
Organic carbon – water partition coefficient (K_{OC})	5,012	l.kg	S4ULs	Inverse Log of 3.70 Log (cm^3 g^{-1}) in reference
Maximum Soil Concentration	4,486	mg/kg	Site Specific	From Phase 2 Source zone Investigation R2174c-R06
Maximum Groundwater Concentration	0.4	mg/l	Site Specific	From Phase 2 Groundwater Investigation R2174c-R09
Half-life for degradation	41	days	EA P5-079/TR1	Acenaphthene as surrogate: Corrected Average degradation rates – results in possible overestimation concentrations at downgradient boreholes due to <LOD concentrations so moderately conservative assumption

APPENDIX B

RTW Worksheets

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aliphatic 5-6			
Target Concentration (C_T)	1.5	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aliphatic 5-6**		
Target concentration	C_T	**1.5**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	2.10E+01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	8.13E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**7.56E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.32E+01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	1.5	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aliphatic 5-6**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**1.5** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**4.62E+00**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.05E+01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aliphatic 5-6		from Level 1
Target Concentration	C_T	1.5	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	7.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.62E+02	fraction
Decay rate used	λ	3.05E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	3.81E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	1.02E+00	mg/l

Remedial Targets

Level 3 Remedial Target	**1.02E+02**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	8.95E+02	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	8.13E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	7.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

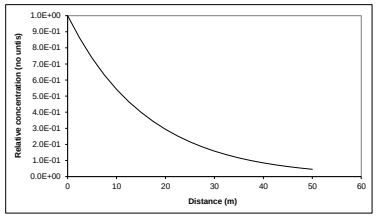
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	3.33E-01
2.5	8.58E-01	2.86E-01
5.0	7.36E-01	2.45E-01
7.5	6.32E-01	2.10E-01
10.0	5.42E-01	1.81E-01
12.5	4.65E-01	1.55E-01
15.0	3.99E-01	1.33E-01
17.5	3.43E-01	1.14E-01
20.0	2.94E-01	9.79E-02
22.5	2.52E-01	8.39E-02
25.0	2.16E-01	7.19E-02
27.5	1.85E-01	6.16E-02
30.0	1.58E-01	5.28E-02
32.5	1.36E-01	4.52E-02
35.0	1.16E-01	3.87E-02
37.5	9.93E-02	3.31E-02
40.0	8.49E-02	2.83E-02
42.5	7.26E-02	2.42E-02
45.0	6.21E-02	2.07E-02
47.5	5.30E-02	1.77E-02
50.0	4.53E-02	1.51E-02

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

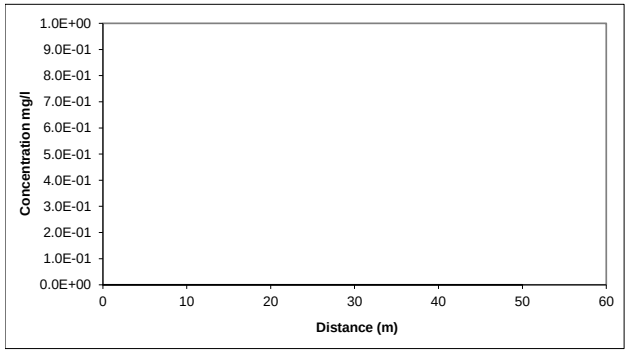
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	2.10E+01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	7.56E+00	l/kg
Factor (partitioning between soil and water)		8.78E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aliphatic 5-6		from Level 1
Target Concentration	C_T	1.50E+00	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	2.30E+00	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	7.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	1.62E+02	fraction
Decay rate used	λ	3.05E-04	d^{-1}
Rate of contaminant flow due to retardation	u	2.57E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	1.18E-02	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	8.13E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	7.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

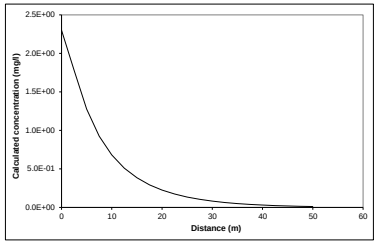
Remedial Targets

Remedial Target		**2.93E+02**	**mg/l**
Domenico - Steady state			
Distance to compliance point		**50**	**m**
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**1.18E-02**	**mg/l**

For comparison with measured groundwater concentration.

Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	2.3E+00
2.5	1.78E+00
5.0	1.28E+00
7.5	9.24E-01
10.0	6.81E-01
12.5	5.09E-01
15.0	3.85E-01
17.5	2.93E-01
20.0	2.25E-01
22.5	1.74E-01
25.0	1.34E-01
27.5	1.04E-01
30.0	8.14E-02
32.5	6.36E-02
35.0	4.98E-02
37.5	3.90E-02
40.0	3.06E-02
42.5	2.41E-02
45.0	1.90E-02
47.5	1.49E-02
50.0	1.18E-02

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aliphatic 5-6**

Parameter	Value	Units
(carried over from input sheet)		
C_T	1.50E+00	mg/l
Kd	7.56E+00	l/kg
foc	9.30E-03	fraction
koc	8.13E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	2.10E+01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			7.56E+00	l/kg

Calculated Remedial Target	**1.32E+01**	**mg/kg**	**for**	**Aliphatic 5-6**

Factor (partitioning between soil and water) 8.78E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aliphatic 5-6**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	1.50E+00	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

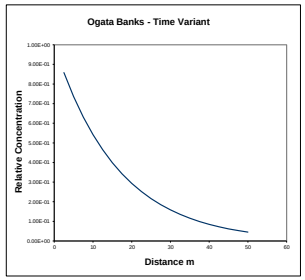
OGATA BANKS SOLUTION

Contaminant	Aliphatic 5-6

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	3.047E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	7.559E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

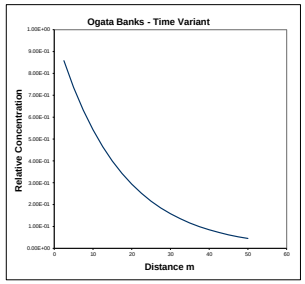
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-7.04E+47	2	6.53E-01	1.92E+00	7.04E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-7.04E+47	2	1.31E+00	3.69E+00	7.04E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-7.04E+47	2	1.96E+00	7.09E+00	7.04E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-7.04E+47	2	2.61E+00	1.36E+01	7.04E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-7.04E+47	2	3.26E+00	2.62E+01	7.04E+47	0	3.00E+00	0.999978	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-7.04E+47	2	3.92E+00	5.03E+01	7.04E+47	0	2.74E+00	0.999892	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-7.04E+47	2	4.57E+00	9.66E+01	7.04E+47	0	2.54E+00	0.999664	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-7.04E+47	2	5.22E+00	1.86E+02	7.04E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-7.04E+47	2	5.88E+00	3.57E+02	7.04E+47	0	2.24E+00	0.998435	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-7.04E+47	2	6.53E+00	6.85E+02	7.04E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-7.04E+47	2	7.18E+00	1.32E+03	7.04E+47	0	2.02E+00	0.995769	-2.02E+00	-0.9958	2.98E+00	0.99998	-2.98E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-7.04E+47	2	7.84E+00	2.53E+03	7.04E+47	0	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	0.99995	-2.86E+00	-0.9999	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-7.04E+47	2	8.49E+00	4.86E+03	7.04E+47	0	1.86E+00	0.991491	-1.86E+00	-0.9915	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-7.04E+47	2	9.14E+00	9.34E+03	7.04E+47	0	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	0.99982	-2.65E+00	-0.9998	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-7.04E+47	2	9.79E+00	1.79E+04	7.04E+47	0	1.73E+00	0.985694	-1.73E+00	-0.9857	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-7.04E+47	2	1.04E+01	3.45E+04	7.04E+47	0	1.68E+00	0.982294	-1.68E+00	-0.9823	2.47E+00	0.99953	-2.47E+00	-0.9995	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-7.04E+47	2	1.11E+01	6.62E+04	7.04E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.9993	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-7.04E+47	2	1.18E+01	1.27E+05	7.04E+47	0	1.58E+00	0.974653	-1.58E+00	-0.9747	2.33E+00	0.99903	-2.33E+00	-0.999	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-7.04E+47	2	1.24E+01	2.44E+05	7.04E+47	0	1.54E+00	0.970477	-1.54E+00	-0.9705	2.27E+00	0.99868	-2.27E+00	-0.9987	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-7.04E+47	2	1.31E+01	4.70E+05	7.04E+47	0	1.50E+00	0.966105	-1.50E+00	-0.9661	2.21E+00	0.99825	-2.21E+00	-0.9983	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	162.4886	
u	0.0038	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-7.04E+47	2	6.53E-01	1.92E+00	7.04E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-7.04E+47	2	1.31E+00	3.69E+00	7.04E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-7.04E+47	2	1.96E+00	7.09E+00	7.04E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-7.04E+47	2	2.61E+00	1.36E+01	7.04E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-7.04E+47	2	3.26E+00	2.62E+01	7.04E+47	0	3.00E+00	0.999978	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-7.04E+47	2	3.92E+00	5.03E+01	7.04E+47	0	2.74E+00	0.999892	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-7.04E+47	2	4.57E+00	9.66E+01	7.04E+47	0	2.54E+00	0.999664	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-7.04E+47	2	5.22E+00	1.86E+02	7.04E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-7.04E+47	2	5.88E+00	3.57E+02	7.04E+47	0	2.24E+00	0.998435	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-7.04E+47	2	6.53E+00	6.85E+02	7.04E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-7.04E+47	2	7.18E+00	1.32E+03	7.04E+47	0	2.02E+00	0.995769	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-7.04E+47	2	7.84E+00	2.53E+03	7.04E+47	0	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-7.04E+47	2	8.49E+00	4.86E+03	7.04E+47	0	1.86E+00	0.991491	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-7.04E+47	2	9.14E+00	9.34E+03	7.04E+47	0	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-7.04E+47	2	9.79E+00	1.79E+04	7.04E+47	0	1.73E+00	0.985694	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-7.04E+47	2	1.04E+01	3.45E+04	7.04E+47	0	1.68E+00	0.982294	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-7.04E+47	2	1.11E+01	6.62E+04	7.04E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-7.04E+47	2	1.18E+01	1.27E+05	7.04E+47	0	1.58E+00	0.974653	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-7.04E+47	2	1.24E+01	2.44E+05	7.04E+47	0	1.54E+00	0.970477	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-7.04E+47	2	1.31E+01	4.70E+05	7.04E+47	0	1.50E+00	0.966105	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

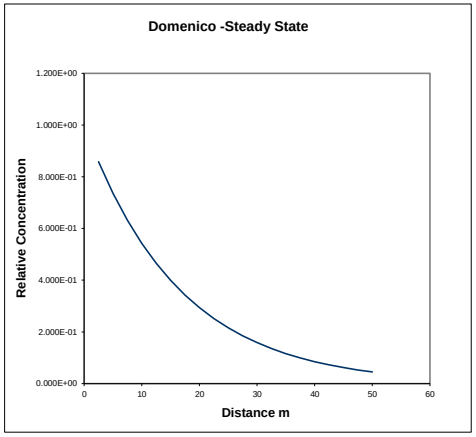
Contaminant **Aliphatic 5-6**

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	3.047E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	7.559E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



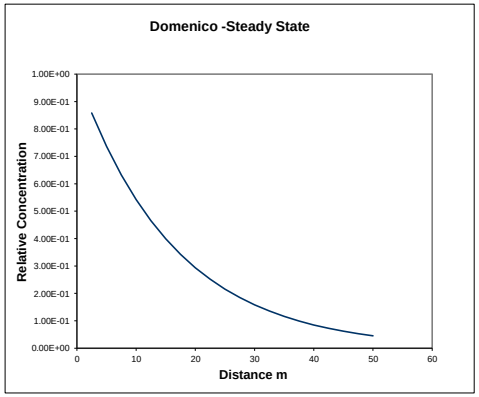
Calc **Value**

v	6.19E-01	m/d
Rc	1.62E+02	
u	3.81E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

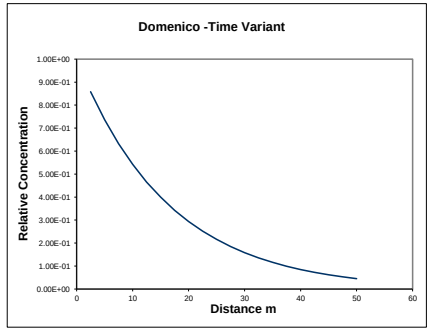
Contaminant **Aliphatic 5-6**

Input	Value	Units
C_T	1.5	mg/l
DF	3.0774	
λ	3.047E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	7.559E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calc	Value	
v	6.19E-01	m/d
Rc	1.62E+02	
u	3.81E-03	m/d

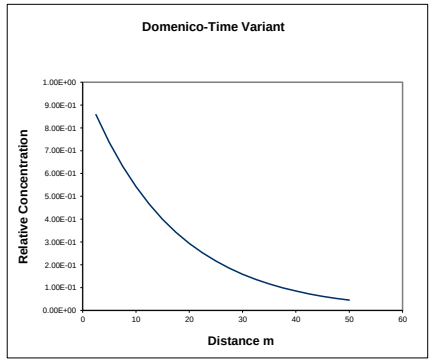
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-7.04E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-7.04E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-7.04E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-7.04E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-7.04E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-7.04E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-7.04E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-7.04E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-7.04E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-7.04E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-7.04E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-7.04E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-7.04E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-7.04E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-7.04E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-7.04E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-7.04E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-7.04E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-7.04E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-7.04E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-7.04E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-7.04E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-7.04E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-7.04E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-7.04E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-7.04E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-7.04E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-7.04E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-7.04E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-7.04E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-7.04E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-7.04E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-7.04E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-7.04E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-7.04E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-7.04E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-7.04E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-7.04E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-7.04E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-7.04E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

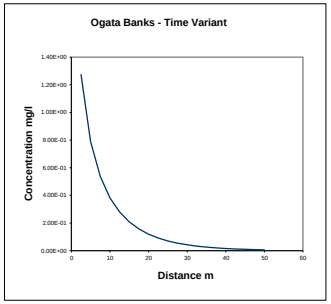
Contaminant	Aliphatic 5-6	
Input	**Value**	**Units**
C_T	1.5	mg/l
Co	2.30E+00	mg/l
λ	3.05E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	7.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	1.62E+02	
u	2.57E-03	m/d

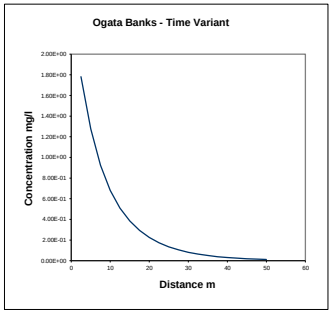
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.2875	-2.1E-01	8.1E-01	-2.1E+48	2.000	7.1E-01	2.0E+00	2.1E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.27E+00
2	5	0.2875	-4.2E-01	6.6E-01	-2.1E+48	2.000	1.4E+00	4.1E+00	2.1E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	7.88E-01
3	7.5	0.2875	-6.3E-01	5.3E-01	-2.1E+48	2.000	2.1E+00	8.4E+00	2.1E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	5.36E-01
4	10	0.2875	-8.4E-01	4.3E-01	-2.1E+48	2.000	2.8E+00	1.7E+01	2.1E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	3.82E-01
5	12.5	0.2875	-1.0E+00	3.5E-01	-2.1E+48	2.000	3.5E+00	3.5E+01	2.1E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	2.80E-01
6	15	0.2875	-1.3E+00	2.9E-01	-2.1E+48	2.000	4.3E+00	7.0E+01	2.1E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	2.08E-01
7	17.5	0.2875	-1.5E+00	2.3E-01	-2.1E+48	2.000	5.0E+00	1.4E+02	2.1E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.57E-01
8	20	0.2875	-1.7E+00	1.9E-01	-2.1E+48	2.000	5.7E+00	2.9E+02	2.1E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	1.19E-01
9	22.5	0.2875	-1.9E+00	1.5E-01	-2.1E+48	2.000	6.4E+00	5.9E+02	2.1E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	9.16E-02
10	25	0.2875	-2.1E+00	1.2E-01	-2.1E+48	2.000	7.1E+00	1.2E+03	2.1E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	7.05E-02
11	27.5	0.2875	-2.3E+00	1.0E-01	-2.1E+48	2.000	7.8E+00	2.4E+03	2.1E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	5.46E-02
12	30	0.2875	-2.5E+00	8.2E-02	-2.1E+48	2.000	8.5E+00	4.9E+03	2.1E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	4.24E-02
13	32.5	0.2875	-2.7E+00	6.6E-02	-2.1E+48	2.000	9.2E+00	1.0E+04	2.1E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	3.30E-02
14	35	0.2875	-2.9E+00	5.4E-02	-2.1E+48	2.000	9.9E+00	2.0E+04	2.1E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	2.58E-02
15	37.5	0.2875	-3.1E+00	4.4E-02	-2.1E+48	2.000	1.1E+01	4.1E+04	2.1E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	2.02E-02
16	40	0.2875	-3.3E+00	3.5E-02	-2.1E+48	2.000	1.1E+01	8.4E+04	2.1E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	1.58E-02
17	42.5	0.2875	-3.5E+00	2.9E-02	-2.1E+48	2.000	1.2E+01	1.7E+05	2.1E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	1.24E-02
18	45	0.2875	-3.8E+00	2.3E-02	-2.1E+48	2.000	1.3E+01	3.5E+05	2.1E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	9.74E-03
19	47.5	0.2875	-4.0E+00	1.9E-02	-2.1E+48	2.000	1.3E+01	7.1E+05	2.1E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	7.67E-03
20	50	0.2875	-4.2E+00	1.5E-02	-2.1E+48	2.000	1.4E+01	1.4E+06	2.1E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	6.04E-03



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.2875	-2.1E-01	8.1E-01	-2.1E+48	2.000	7.1E-01	2.0E+00	2.1E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.78E+00
2	5	0.2875	-4.2E-01	6.6E-01	-2.1E+48	2.000	1.4E+00	4.1E+00	2.1E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	1.28E+00
3	7.5	0.2875	-6.3E-01	5.3E-01	-2.1E+48	2.000	2.1E+00	8.4E+00	2.1E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	9.24E-01
4	10	0.2875	-8.4E-01	4.3E-01	-2.1E+48	2.000	2.8E+00	1.7E+01	2.1E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	6.81E-01
5	12.5	0.2875	-1.0E+00	3.5E-01	-2.1E+48	2.000	3.5E+00	3.5E+01	2.1E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	5.09E-01
6	15	0.2875	-1.3E+00	2.9E-01	-2.1E+48	2.000	4.3E+00	7.0E+01	2.1E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	3.85E-01
7	17.5	0.2875	-1.5E+00	2.3E-01	-2.1E+48	2.000	5.0E+00	1.4E+02	2.1E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	2.93E-01
8	20	0.2875	-1.7E+00	1.9E-01	-2.1E+48	2.000	5.7E+00	2.9E+02	2.1E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	2.25E-01
9	22.5	0.2875	-1.9E+00	1.5E-01	-2.1E+48	2.000	6.4E+00	5.9E+02	2.1E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.74E-01
10	25	0.2875	-2.1E+00	1.2E-01	-2.1E+48	2.000	7.1E+00	1.2E+03	2.1E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	1.34E-01
11	27.5	0.2875	-2.3E+00	1.0E-01	-2.1E+48	2.000	7.8E+00	2.4E+03	2.1E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.04E-01
12	30	0.2875	-2.5E+00	8.2E-02	-2.1E+48	2.000	8.5E+00	4.9E+03	2.1E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	8.14E-02
13	32.5	0.2875	-2.7E+00	6.6E-02	-2.1E+48	2.000	9.2E+00	1.0E+04	2.1E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	6.36E-02
14	35	0.2875	-2.9E+00	5.4E-02	-2.1E+48	2.000	9.9E+00	2.0E+04	2.1E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	4.98E-02
15	37.5	0.2875	-3.1E+00	4.4E-02	-2.1E+48	2.000	1.1E+01	4.1E+04	2.1E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	3.90E-02
16	40	0.2875	-3.3E+00	3.5E-02	-2.1E+48	2.000	1.1E+01	8.4E+04	2.1E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	3.06E-02
17	42.5	0.2875	-3.5E+00	2.9E-02	-2.1E+48	2.000	1.2E+01	1.7E+05	2.1E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	2.41E-02
18	45	0.2875	-3.8E+00	2.3E-02	-2.1E+48	2.000	1.3E+01	3.5E+05	2.1E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	1.90E-02
19	47.5	0.2875	-4.0E+00	1.9E-02	-2.1E+48	2.000	1.3E+01	7.1E+05	2.1E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	1.49E-02
20	50	0.2875	-4.2E+00	1.5E-02	-2.1E+48	2.000	1.4E+01	1.4E+06	2.1E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	1.18E-02



Date:	13.07.2021
Version:	1

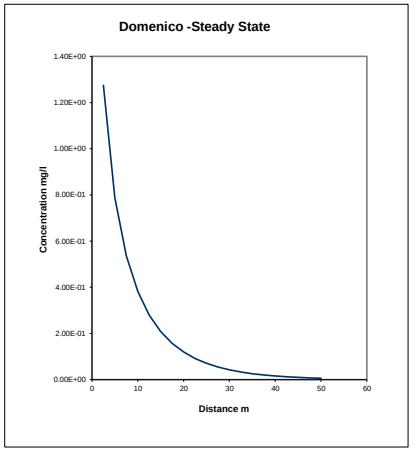
DOMENICO (STEADY STATE)

Contaminant **Aliphatic 5-6**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.5	mg/l
Co	2.30E+00	mg/l
λ	3.05E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	7.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.575	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.27E+00
2	5	0.575	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	7.88E-01
3	7.5	0.575	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	5.36E-01
4	10	0.575	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	3.82E-01
5	12.5	0.575	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	2.80E-01
6	15	0.575	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	2.08E-01
7	17.5	0.575	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.57E-01
8	20	0.575	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	1.19E-01
9	22.5	0.575	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	9.16E-02
10	25	0.575	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	7.05E-02
11	27.5	0.575	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	5.46E-02
12	30	0.575	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	4.24E-02
13	32.5	0.575	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	3.30E-02
14	35	0.575	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	2.58E-02
15	37.5	0.575	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	2.02E-02
16	40	0.575	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	1.58E-02
17	42.5	0.575	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	1.24E-02
18	45	0.575	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	9.74E-03
19	47.5	0.575	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	7.67E-03
20	50	0.575	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	6.04E-03



Vertical dispersion optio Simulate vertical dispersion in 1 direction

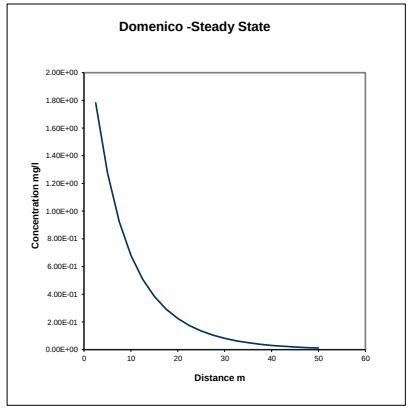
Calc **Value**

v	4.18E-01	m/d
Rc	1.62E+02	
u	2.57E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.575	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.78E+00
2	5	0.575	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	1.28E+00
3	7.5	0.575	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	9.24E-01
4	10	0.575	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	6.81E-01
5	12.5	0.575	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	5.09E-01
6	15	0.575	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	3.85E-01
7	17.5	0.575	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	2.93E-01
8	20	0.575	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	2.25E-01
9	22.5	0.575	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.74E-01
10	25	0.575	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	1.34E-01
11	27.5	0.575	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.04E-01
12	30	0.575	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	8.14E-02
13	32.5	0.575	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	6.36E-02
14	35	0.575	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	4.98E-02
15	37.5	0.575	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	3.90E-02
16	40	0.575	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	3.06E-02
17	42.5	0.575	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	2.41E-02
18	45	0.575	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	1.90E-02
19	47.5	0.575	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	1.49E-02
20	50	0.575	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	1.18E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

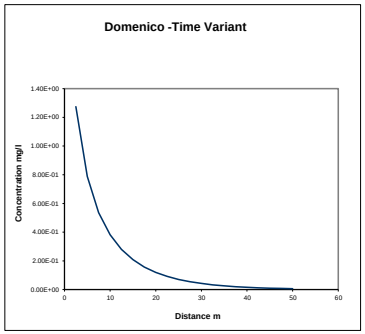
Contaminant **Aliphatic 5-6**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.5	mg/l
Co	2.30E+00	mg/l
λ	3.05E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	7.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

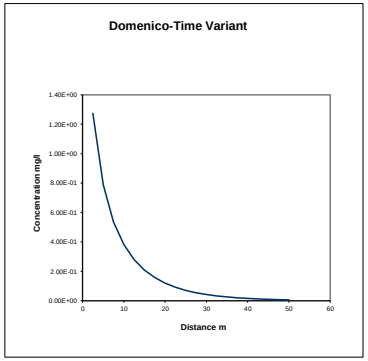
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.2875	-2.09E-01	8.12E-01	-2.08E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.27E+00
2	5	0.2875	-4.18E-01	6.59E-01	-2.08E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	7.88E-01
3	7.5	0.2875	-6.26E-01	5.35E-01	-2.08E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	5.36E-01
4	10	0.2875	-8.35E-01	4.34E-01	-2.08E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	3.82E-01
5	12.5	0.2875	-1.04E+00	3.52E-01	-2.08E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	2.80E-01
6	15	0.2875	-1.25E+00	2.86E-01	-2.08E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	2.08E-01
7	17.5	0.2875	-1.46E+00	2.32E-01	-2.08E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.57E-01
8	20	0.2875	-1.67E+00	1.88E-01	-2.08E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	1.19E-01
9	22.5	0.2875	-1.88E+00	1.53E-01	-2.08E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	9.16E-02
10	25	0.2875	-2.09E+00	1.24E-01	-2.08E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	7.05E-02
11	27.5	0.2875	-2.30E+00	1.01E-01	-2.08E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	5.46E-02
12	30	0.2875	-2.51E+00	8.16E-02	-2.08E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	4.24E-02
13	32.5	0.2875	-2.71E+00	6.62E-02	-2.08E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	3.30E-02
14	35	0.2875	-2.92E+00	5.38E-02	-2.08E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	2.58E-02
15	37.5	0.2875	-3.13E+00	4.36E-02	-2.08E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	2.02E-02
16	40	0.2875	-3.34E+00	3.54E-02	-2.08E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	1.58E-02
17	42.5	0.2875	-3.55E+00	2.87E-02	-2.08E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	1.24E-02
18	45	0.2875	-3.76E+00	2.33E-02	-2.08E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	9.74E-03
19	47.5	0.2875	-3.97E+00	1.89E-02	-2.08E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	7.67E-03
20	50	0.2875	-4.18E+00	1.54E-02	-2.08E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	6.04E-03



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

Calc	Value	
v	4.18E-01	m/d
Rc	1.62E+02	
u	2.57E-03	m/d

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.2875	-2.09E-01	8.12E-01	-2.08E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.78E+00
2	5	0.2875	-4.18E-01	6.59E-01	-2.08E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	1.28E+00
3	7.5	0.2875	-6.26E-01	5.35E-01	-2.08E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	9.24E-01
4	10	0.2875	-8.35E-01	4.34E-01	-2.08E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	6.81E-01
5	12.5	0.2875	-1.04E+00	3.52E-01	-2.08E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	5.09E-01
6	15	0.2875	-1.25E+00	2.86E-01	-2.08E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	3.85E-01
7	17.5	0.2875	-1.46E+00	2.32E-01	-2.08E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	2.93E-01
8	20	0.2875	-1.67E+00	1.88E-01	-2.08E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	2.25E-01
9	22.5	0.2875	-1.88E+00	1.53E-01	-2.08E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.74E-01
10	25	0.2875	-2.09E+00	1.24E-01	-2.08E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	1.34E-01
11	27.5	0.2875	-2.30E+00	1.01E-01	-2.08E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.04E-01
12	30	0.2875	-2.51E+00	8.16E-02	-2.08E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	8.14E-02
13	32.5	0.2875	-2.71E+00	6.62E-02	-2.08E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	6.36E-02
14	35	0.2875	-2.92E+00	5.38E-02	-2.08E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	4.98E-02
15	37.5	0.2875	-3.13E+00	4.36E-02	-2.08E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	3.90E-02
16	40	0.2875	-3.34E+00	3.54E-02	-2.08E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	3.06E-02
17	42.5	0.2875	-3.55E+00	2.87E-02	-2.08E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	2.41E-02
18	45	0.2875	-3.76E+00	2.33E-02	-2.08E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	1.90E-02
19	47.5	0.2875	-3.97E+00	1.89E-02	-2.08E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	1.49E-02
20	50	0.2875	-4.18E+00	1.54E-02	-2.08E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	1.18E-02



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aliphatic 6-8			
Target Concentration (C_T)	1.5	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Environment Agency

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aliphatic 6-8**		
Target concentration	**C_T**	**1.5**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	2.73E+01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	3.80E+03	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**3.54E+01**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**5.54E+01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	1.5	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aliphatic 6-8**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**1.5** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**4.62E+00**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.70E+02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aliphatic 6-8		from Level 1
Target Concentration	C_T	1.5	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		368	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.54E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	7.56E+02	fraction
Decay rate used	λ	6.55E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	8.19E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	9.97E+00	mg/l

Remedial Targets

Level 3 Remedial Target	**1.02E+02**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	3.76E+03	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.80E+03	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.54E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

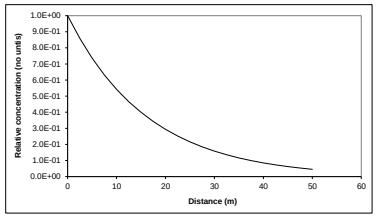
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	3.24E+00
2.5	8.58E-01	2.78E+00
5.0	7.36E-01	2.39E+00
7.5	6.32E-01	2.05E+00
10.0	5.42E-01	1.76E+00
12.5	4.65E-01	1.51E+00
15.0	3.99E-01	1.29E+00
17.5	3.43E-01	1.11E+00
20.0	2.94E-01	9.52E-01
22.5	2.52E-01	8.16E-01
25.0	2.16E-01	7.00E-01
27.5	1.85E-01	6.00E-01
30.0	1.58E-01	5.13E-01
32.5	1.36E-01	4.40E-01
35.0	1.16E-01	3.76E-01
37.5	9.93E-02	3.22E-01
40.0	8.49E-02	2.75E-01
42.5	7.26E-02	2.35E-01
45.0	6.21E-02	2.01E-01
47.5	5.30E-02	1.72E-01
50.0	4.53E-02	1.47E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

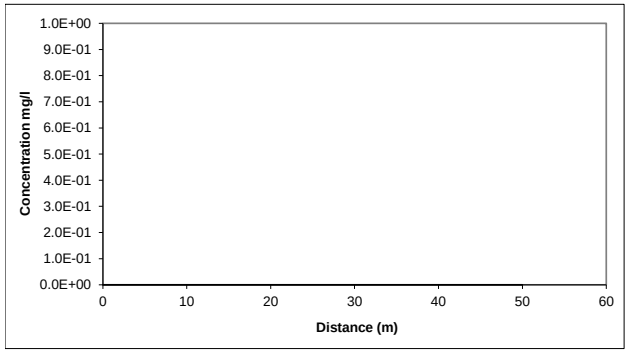
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	2.73E+01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	3.54E+01	l/kg
Factor (partitioning between soil and water)		3.69E+01	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aliphatic 6-8		from Level 1
Target Concentration	C_T	1.50E+00	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	4.52E+01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.54E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	7.57E+02	fraction
Decay rate used	λ	6.54E-05	d^{-1}
Rate of contaminant flow due to retardation	u	5.53E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	2.32E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**2.93E+02**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**2.32E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.80E+03	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.54E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

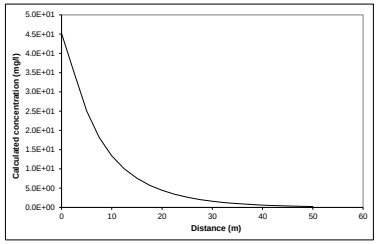
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	4.5E+01
2.5	3.50E+01
5.0	2.51E+01
7.5	1.82E+01
10.0	1.34E+01
12.5	1.00E+01
15.0	7.56E+00
17.5	5.77E+00
20.0	4.42E+00
22.5	3.41E+00
25.0	2.64E+00
27.5	2.05E+00
30.0	1.60E+00
32.5	1.25E+00
35.0	9.78E-01
37.5	7.67E-01
40.0	6.02E-01
42.5	4.73E-01
45.0	3.73E-01
47.5	2.94E-01
50.0	2.32E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aliphatic 6-8**

Parameter	Value	Units
(carried over from input sheet)		
C_T	1.50E+00	mg/l
Kd	3.54E+01	l/kg
foc	9.30E-03	fraction
koc	3.80E+03	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	2.73E+01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 3.54E+01 l/kg

Calculated Remedial Target **5.54E+01 mg/kg** **for Aliphatic 6-8**

Factor (partitioning between soil and water) 3.69E+01

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aliphatic 6-8**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	1.50E+00	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

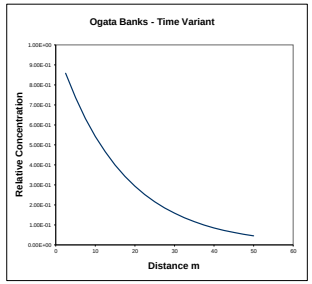
OGATA BANKS SOLUTION

Contaminant **Aliphatic 6-8**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	6.546E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

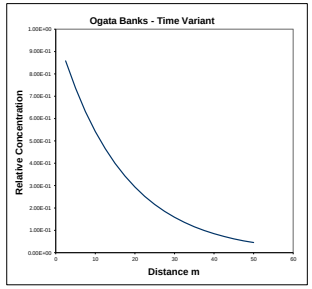
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.26E+47	2	6.53E-01	1.92E+00	3.26E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.26E+47	2	1.31E+00	3.69E+00	3.26E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.26E+47	2	1.96E+00	7.09E+00	3.26E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.26E+47	2	2.61E+00	1.36E+01	3.26E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.26E+47	2	3.26E+00	2.62E+01	3.26E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.26E+47	2	3.92E+00	5.03E+01	3.26E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.26E+47	2	4.57E+00	9.66E+01	3.26E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.26E+47	2	5.22E+00	1.86E+02	3.26E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.26E+47	2	5.88E+00	3.57E+02	3.26E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.26E+47	2	6.53E+00	6.85E+02	3.26E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.26E+47	2	7.18E+00	1.32E+03	3.26E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.26E+47	2	7.84E+00	2.53E+03	3.26E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.26E+47	2	8.49E+00	4.86E+03	3.26E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.26E+47	2	9.14E+00	9.34E+03	3.26E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.26E+47	2	9.79E+00	1.79E+04	3.26E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.26E+47	2	1.04E+01	3.45E+04	3.26E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.26E+47	2	1.11E+01	6.62E+04	3.26E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.26E+47	2	1.18E+01	1.27E+05	3.26E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.26E+47	2	1.24E+01	2.44E+05	3.26E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.26E+47	2	1.31E+01	4.70E+05	3.26E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	756.3883	
u	0.0008	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.26E+47	2	6.53E-01	1.92E+00	3.26E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.26E+47	2	1.31E+00	3.69E+00	3.26E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.26E+47	2	1.96E+00	7.09E+00	3.26E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.26E+47	2	2.61E+00	1.36E+01	3.26E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.26E+47	2	3.26E+00	2.62E+01	3.26E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.26E+47	2	3.92E+00	5.03E+01	3.26E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.26E+47	2	4.57E+00	9.66E+01	3.26E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.26E+47	2	5.22E+00	1.86E+02	3.26E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.26E+47	2	5.88E+00	3.57E+02	3.26E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.26E+47	2	6.53E+00	6.85E+02	3.26E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.26E+47	2	7.18E+00	1.32E+03	3.26E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.26E+47	2	7.84E+00	2.53E+03	3.26E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.26E+47	2	8.49E+00	4.86E+03	3.26E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.26E+47	2	9.14E+00	9.34E+03	3.26E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.26E+47	2	9.79E+00	1.79E+04	3.26E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.26E+47	2	1.04E+01	3.45E+04	3.26E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.26E+47	2	1.11E+01	6.62E+04	3.26E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.26E+47	2	1.18E+01	1.27E+05	3.26E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.26E+47	2	1.24E+01	2.44E+05	3.26E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.26E+47	2	1.31E+01	4.70E+05	3.26E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

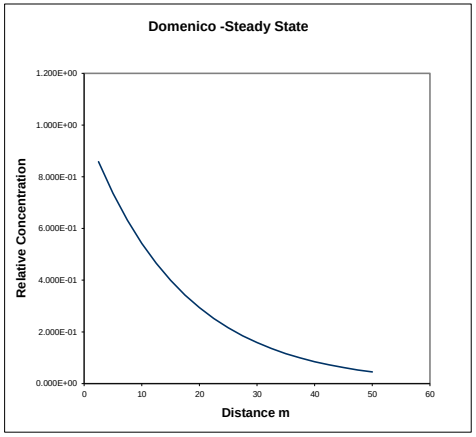
Contaminant **Aliphatic 6-8**

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	6.546E-05	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



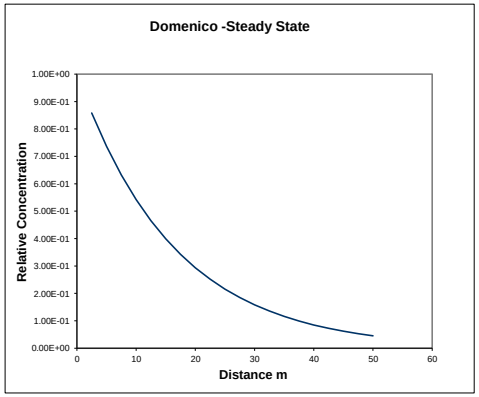
Calc **Value**

v	6.19E-01	m/d
Rc	7.56E+02	
u	8.19E-04	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

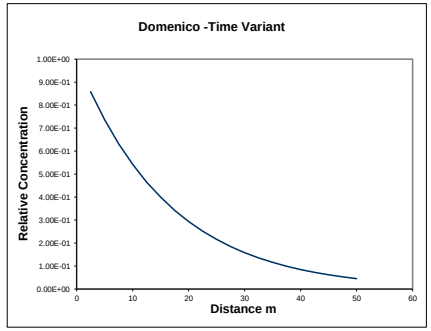
DOMENICO (TIME VARIANT)

Contaminant **Aliphatic 6-8**

Input	Value	Units
C_T	1.5	mg/l
DF	3.0774	
λ	6.546E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

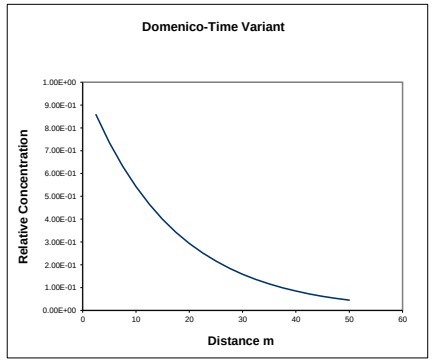
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.26E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.26E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.26E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.26E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.26E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.26E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.26E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.26E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.26E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.26E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.26E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.26E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.26E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.26E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.26E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.26E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.26E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.26E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.26E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.26E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calc	Value	
v	6.19E-01	m/d
Rc	7.56E+02	
u	8.19E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.26E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.26E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.26E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.26E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.26E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.26E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.26E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.26E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.26E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.26E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.26E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.26E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.26E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.26E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.26E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.26E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.26E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.26E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.26E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.26E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

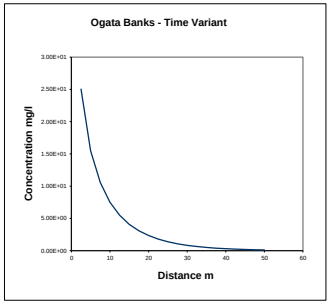
Contaminant	Aliphatic 6-8	
Input	**Value**	**Units**
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

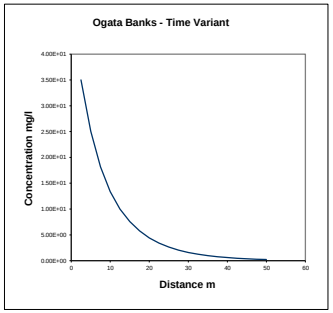
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	5.65	-2.1E-01	8.1E-01	-9.6E+47	2.000	7.1E-01	2.0E+00	9.6E+47	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.50E+01
2	5	5.65	-4.2E-01	6.6E-01	-9.6E+47	2.000	1.4E+00	4.1E+00	9.6E+47	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.55E+01
3	7.5	5.65	-6.3E-01	5.3E-01	-9.6E+47	2.000	2.1E+00	8.4E+00	9.6E+47	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.05E+01
4	10	5.65	-8.4E-01	4.3E-01	-9.6E+47	2.000	2.8E+00	1.7E+01	9.6E+47	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	7.51E+00
5	12.5	5.65	-1.0E+00	3.5E-01	-9.6E+47	2.000	3.5E+00	3.5E+01	9.6E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	5.49E+00
6	15	5.65	-1.3E+00	2.9E-01	-9.6E+47	2.000	4.3E+00	7.0E+01	9.6E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	4.09E+00
7	17.5	5.65	-1.5E+00	2.3E-01	-9.6E+47	2.000	5.0E+00	1.4E+02	9.6E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	3.09E+00
8	20	5.65	-1.7E+00	1.9E-01	-9.6E+47	2.000	5.7E+00	2.9E+02	9.6E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	2.35E+00
9	22.5	5.65	-1.9E+00	1.5E-01	-9.6E+47	2.000	6.4E+00	5.9E+02	9.6E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	1.80E+00
10	25	5.65	-2.1E+00	1.2E-01	-9.6E+47	2.000	7.1E+00	1.2E+03	9.6E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.39E+00
11	27.5	5.65	-2.3E+00	1.0E-01	-9.6E+47	2.000	7.8E+00	2.4E+03	9.6E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	1.07E+00
12	30	5.65	-2.5E+00	8.2E-02	-9.6E+47	2.000	8.5E+00	4.9E+03	9.6E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	8.33E-01
13	32.5	5.65	-2.7E+00	6.6E-02	-9.6E+47	2.000	9.2E+00	1.0E+04	9.6E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	6.49E-01
14	35	5.65	-2.9E+00	5.4E-02	-9.6E+47	2.000	9.9E+00	2.0E+04	9.6E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	5.06E-01
15	37.5	5.65	-3.1E+00	4.4E-02	-9.6E+47	2.000	1.1E+01	4.1E+04	9.6E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	3.96E-01
16	40	5.65	-3.3E+00	3.5E-02	-9.6E+47	2.000	1.1E+01	8.4E+04	9.6E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	3.10E-01
17	42.5	5.65	-3.5E+00	2.9E-02	-9.6E+47	2.000	1.2E+01	1.7E+05	9.6E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	2.44E-01
18	45	5.65	-3.8E+00	2.3E-02	-9.6E+47	2.000	1.3E+01	3.5E+05	9.6E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.91E-01
19	47.5	5.65	-4.0E+00	1.9E-02	-9.6E+47	2.000	1.3E+01	7.1E+05	9.6E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.51E-01
20	50	5.65	-4.2E+00	1.5E-02	-9.6E+47	2.000	1.4E+01	1.4E+06	9.6E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	1.19E-01



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	5.65	-2.1E-01	8.1E-01	-9.6E+47	2.000	7.1E-01	2.0E+00	9.6E+47	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	3.50E+01
2	5	5.65	-4.2E-01	6.6E-01	-9.6E+47	2.000	1.4E+00	4.1E+00	9.6E+47	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	2.51E+01
3	7.5	5.65	-6.3E-01	5.3E-01	-9.6E+47	2.000	2.1E+00	8.4E+00	9.6E+47	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.82E+01
4	10	5.65	-8.4E-01	4.3E-01	-9.6E+47	2.000	2.8E+00	1.7E+01	9.6E+47	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.34E+01
5	12.5	5.65	-1.0E+00	3.5E-01	-9.6E+47	2.000	3.5E+00	3.5E+01	9.6E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	1.00E+01
6	15	5.65	-1.3E+00	2.9E-01	-9.6E+47	2.000	4.3E+00	7.0E+01	9.6E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	7.56E+00
7	17.5	5.65	-1.5E+00	2.3E-01	-9.6E+47	2.000	5.0E+00	1.4E+02	9.6E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	5.77E+00
8	20	5.65	-1.7E+00	1.9E-01	-9.6E+47	2.000	5.7E+00	2.9E+02	9.6E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	4.42E+00
9	22.5	5.65	-1.9E+00	1.5E-01	-9.6E+47	2.000	6.4E+00	5.9E+02	9.6E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	3.41E+00
10	25	5.65	-2.1E+00	1.2E-01	-9.6E+47	2.000	7.1E+00	1.2E+03	9.6E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	2.64E+00
11	27.5	5.65	-2.3E+00	1.0E-01	-9.6E+47	2.000	7.8E+00	2.4E+03	9.6E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	2.05E+00
12	30	5.65	-2.5E+00	8.2E-02	-9.6E+47	2.000	8.5E+00	4.9E+03	9.6E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.60E+00
13	32.5	5.65	-2.7E+00	6.6E-02	-9.6E+47	2.000	9.2E+00	1.0E+04	9.6E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.25E+00
14	35	5.65	-2.9E+00	5.4E-02	-9.6E+47	2.000	9.9E+00	2.0E+04	9.6E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	9.78E-01
15	37.5	5.65	-3.1E+00	4.4E-02	-9.6E+47	2.000	1.1E+01	4.1E+04	9.6E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	7.67E-01
16	40	5.65	-3.3E+00	3.5E-02	-9.6E+47	2.000	1.1E+01	8.4E+04	9.6E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	6.02E-01
17	42.5	5.65	-3.5E+00	2.9E-02	-9.6E+47	2.000	1.2E+01	1.7E+05	9.6E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	4.73E-01
18	45	5.65	-3.8E+00	2.3E-02	-9.6E+47	2.000	1.3E+01	3.5E+05	9.6E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.73E-01
19	47.5	5.65	-4.0E+00	1.9E-02	-9.6E+47	2.000	1.3E+01	7.1E+05	9.6E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	2.94E-01
20	50	5.65	-4.2E+00	1.5E-02	-9.6E+47	2.000	1.4E+01	1.4E+06	9.6E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	2.32E-01



Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

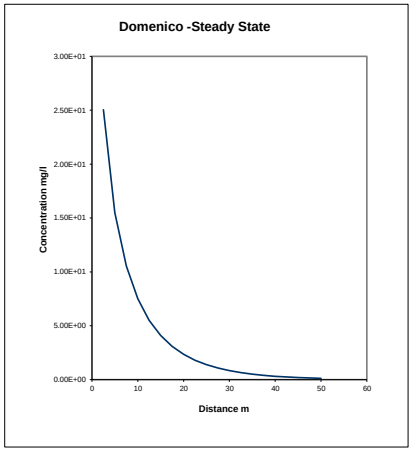
Contaminant **Aliphatic 6-8**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	11.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.50E+01
2	5	11.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.55E+01
3	7.5	11.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.05E+01
4	10	11.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	7.51E+00
5	12.5	11.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	5.49E+00
6	15	11.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	4.09E+00
7	17.5	11.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	3.09E+00
8	20	11.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	2.35E+00
9	22.5	11.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	1.80E+00
10	25	11.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.39E+00
11	27.5	11.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	1.07E+00
12	30	11.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	8.33E-01
13	32.5	11.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	6.49E-01
14	35	11.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	5.06E-01
15	37.5	11.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	3.96E-01
16	40	11.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	3.10E-01
17	42.5	11.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	2.44E-01
18	45	11.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.91E-01
19	47.5	11.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.51E-01
20	50	11.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	1.19E-01



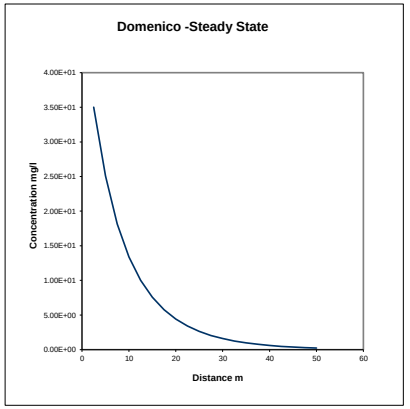
DOMENICO (STEADY STATE)

Calc **Value**

v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	11.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	3.50E+01
2	5	11.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	2.51E+01
3	7.5	11.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.82E+01
4	10	11.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.34E+01
5	12.5	11.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	1.00E+01
6	15	11.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	7.56E+00
7	17.5	11.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	5.77E+00
8	20	11.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	4.42E+00
9	22.5	11.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	3.41E+00
10	25	11.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	2.64E+00
11	27.5	11.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	2.05E+00
12	30	11.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.60E+00
13	32.5	11.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.25E+00
14	35	11.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	9.78E-01
15	37.5	11.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	7.67E-01
16	40	11.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	6.02E-01
17	42.5	11.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	4.73E-01
18	45	11.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.73E-01
19	47.5	11.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	2.94E-01
20	50	11.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	2.32E-01



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

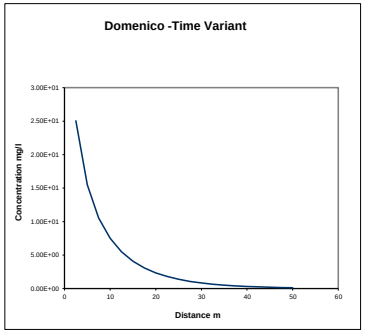
Contaminant **Aliphatic 6-8**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	5.65	-2.09E-01	8.12E-01	-9.65E+47	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.50E+01
2	5	5.65	-4.18E-01	6.59E-01	-9.65E+47	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.55E+01
3	7.5	5.65	-6.26E-01	5.35E-01	-9.65E+47	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.05E+01
4	10	5.65	-8.35E-01	4.34E-01	-9.65E+47	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	7.51E+00
5	12.5	5.65	-1.04E+00	3.52E-01	-9.65E+47	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	5.49E+00
6	15	5.65	-1.25E+00	2.86E-01	-9.65E+47	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	4.09E+00
7	17.5	5.65	-1.46E+00	2.32E-01	-9.65E+47	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	3.09E+00
8	20	5.65	-1.67E+00	1.88E-01	-9.65E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	2.35E+00
9	22.5	5.65	-1.88E+00	1.53E-01	-9.65E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	1.80E+00
10	25	5.65	-2.09E+00	1.24E-01	-9.65E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.39E+00
11	27.5	5.65	-2.30E+00	1.01E-01	-9.65E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	1.07E+00
12	30	5.65	-2.51E+00	8.16E-02	-9.65E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	8.33E-01
13	32.5	5.65	-2.71E+00	6.62E-02	-9.65E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	6.49E-01
14	35	5.65	-2.92E+00	5.38E-02	-9.65E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	5.06E-01
15	37.5	5.65	-3.13E+00	4.36E-02	-9.65E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	3.96E-01
16	40	5.65	-3.34E+00	3.54E-02	-9.65E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	3.10E-01
17	42.5	5.65	-3.55E+00	2.87E-02	-9.65E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	2.44E-01
18	45	5.65	-3.76E+00	2.33E-02	-9.65E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.91E-01
19	47.5	5.65	-3.97E+00	1.89E-02	-9.65E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.51E-01
20	50	5.65	-4.18E+00	1.54E-02	-9.65E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	1.19E-01

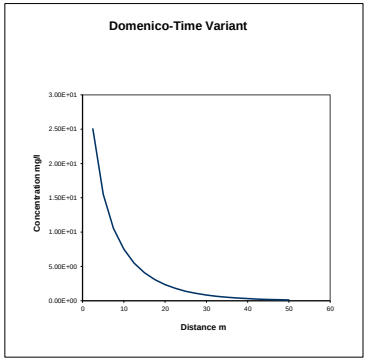


Calc **Value**

v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	5.65	-2.09E-01	8.12E-01	-9.65E+47	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	3.50E+01
2	5	5.65	-4.18E-01	6.59E-01	-9.65E+47	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	2.51E+01
3	7.5	5.65	-6.26E-01	5.35E-01	-9.65E+47	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.82E+01
4	10	5.65	-8.35E-01	4.34E-01	-9.65E+47	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.34E+01
5	12.5	5.65	-1.04E+00	3.52E-01	-9.65E+47	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	1.00E+01
6	15	5.65	-1.25E+00	2.86E-01	-9.65E+47	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	7.56E+00
7	17.5	5.65	-1.46E+00	2.32E-01	-9.65E+47	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	5.77E+00
8	20	5.65	-1.67E+00	1.88E-01	-9.65E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	4.42E+00
9	22.5	5.65	-1.88E+00	1.53E-01	-9.65E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	3.41E+00
10	25	5.65	-2.09E+00	1.24E-01	-9.65E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	2.64E+00
11	27.5	5.65	-2.30E+00	1.01E-01	-9.65E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	2.05E+00
12	30	5.65	-2.51E+00	8.16E-02	-9.65E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.60E+00
13	32.5	5.65	-2.71E+00	6.62E-02	-9.65E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.25E+00
14	35	5.65	-2.92E+00	5.38E-02	-9.65E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	9.78E-01
15	37.5	5.65	-3.13E+00	4.36E-02	-9.65E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	7.67E-01
16	40	5.65	-3.34E+00	3.54E-02	-9.65E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	6.02E-01
17	42.5	5.65	-3.55E+00	2.87E-02	-9.65E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	4.73E-01
18	45	5.65	-3.76E+00	2.33E-02	-9.65E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.73E-01
19	47.5	5.65	-3.97E+00	1.89E-02	-9.65E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	2.94E-01
20	50	5.65	-4.18E+00	1.54E-02	-9.65E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	2.32E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aliphatic 6-8			
Target Concentration (C_T)	1.5	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aliphatic 6-8**		
Target concentration	C_T	**1.5**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	2.73E+01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	3.80E+03	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**3.54E+01**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**5.54E+01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	1.5	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aliphatic 6-8**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**1.5** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**4.62E+00**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.70E+02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Aliphatic 6-8		from Level 1
Target Concentration	C_T	1.5	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		368	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.54E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	7.56E+02	fraction
Decay rate used	λ	6.55E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	8.19E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	9.97E+00	mg/l

Remedial Targets

Level 3 Remedial Target	**1.02E+02**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	3.76E+03	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.80E+03	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.54E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

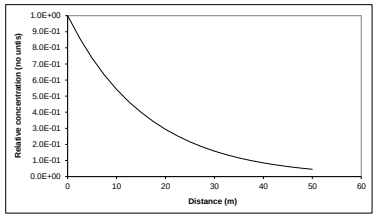
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	3.24E+00
2.5	8.58E-01	2.78E+00
5.0	7.36E-01	2.39E+00
7.5	6.32E-01	2.05E+00
10.0	5.42E-01	1.76E+00
12.5	4.65E-01	1.51E+00
15.0	3.99E-01	1.29E+00
17.5	3.43E-01	1.11E+00
20.0	2.94E-01	9.52E-01
22.5	2.52E-01	8.16E-01
25.0	2.16E-01	7.00E-01
27.5	1.85E-01	6.00E-01
30.0	1.58E-01	5.13E-01
32.5	1.36E-01	4.40E-01
35.0	1.16E-01	3.76E-01
37.5	9.93E-02	3.22E-01
40.0	8.49E-02	2.75E-01
42.5	7.26E-02	2.35E-01
45.0	6.21E-02	2.01E-01
47.5	5.30E-02	1.72E-01
50.0	4.53E-02	1.47E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

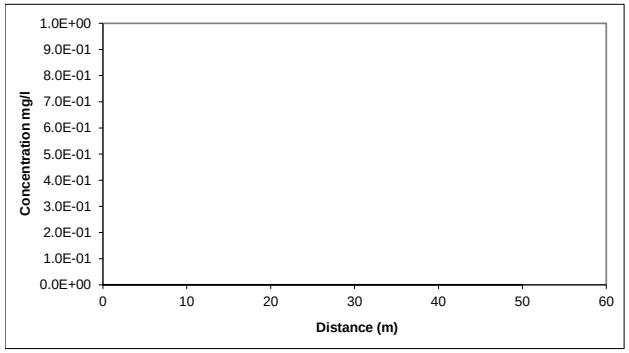
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	2.73E+01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	3.54E+01	l/kg
Factor (partitioning between soil and water)		3.69E+01	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aliphatic 6-8		from Level 1
Target Concentration	C_T	1.50E+00	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	4.52E+01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.54E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	7.57E+02	fraction
Decay rate used	λ	6.54E-05	d^{-1}
Rate of contaminant flow due to retardation	u	5.53E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	2.32E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**2.93E+02**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**2.32E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.80E+03	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.54E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

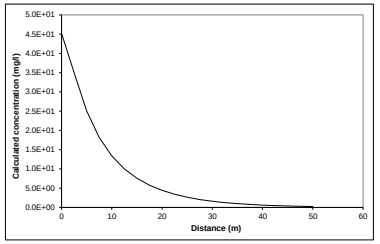
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	4.5E+01
2.5	3.50E+01
5.0	2.51E+01
7.5	1.82E+01
10.0	1.34E+01
12.5	1.00E+01
15.0	7.56E+00
17.5	5.77E+00
20.0	4.42E+00
22.5	3.41E+00
25.0	2.64E+00
27.5	2.05E+00
30.0	1.60E+00
32.5	1.25E+00
35.0	9.78E-01
37.5	7.67E-01
40.0	6.02E-01
42.5	4.73E-01
45.0	3.73E-01
47.5	2.94E-01
50.0	2.32E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aliphatic 6-8**

Parameter	Value	Units
(carried over from input sheet)		
C_T	1.50E+00	mg/l
Kd	3.54E+01	l/kg
foc	9.30E-03	fraction
koc	3.80E+03	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	2.73E+01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			3.54E+01	l/kg

Calculated Remedial Target	**5.54E+01**	**mg/kg**	**for**	**Aliphatic 6-8**

Factor (partitioning between soil and water) 3.69E+01

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aliphatic 6-8**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	1.50E+00	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

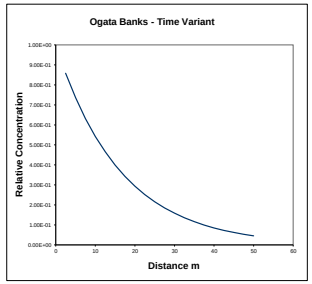
OGATA BANKS SOLUTION

Contaminant **Aliphatic 6-8**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	6.546E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

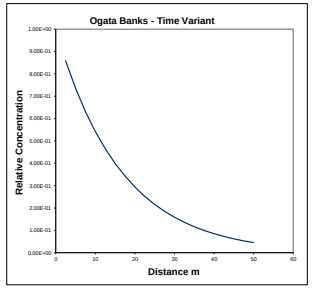
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.26E+47	2	6.53E-01	1.92E+00	3.26E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.26E+47	2	1.31E+00	3.69E+00	3.26E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.26E+47	2	1.96E+00	7.09E+00	3.26E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.26E+47	2	2.61E+00	1.36E+01	3.26E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.26E+47	2	3.26E+00	2.62E+01	3.26E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.26E+47	2	3.92E+00	5.03E+01	3.26E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.26E+47	2	4.57E+00	9.66E+01	3.26E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.26E+47	2	5.22E+00	1.86E+02	3.26E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.26E+47	2	5.88E+00	3.57E+02	3.26E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.26E+47	2	6.53E+00	6.85E+02	3.26E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.26E+47	2	7.18E+00	1.32E+03	3.26E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.26E+47	2	7.84E+00	2.53E+03	3.26E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.26E+47	2	8.49E+00	4.86E+03	3.26E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.26E+47	2	9.14E+00	9.34E+03	3.26E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.26E+47	2	9.79E+00	1.79E+04	3.26E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.26E+47	2	1.04E+01	3.45E+04	3.26E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.26E+47	2	1.11E+01	6.62E+04	3.26E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.26E+47	2	1.18E+01	1.27E+05	3.26E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.26E+47	2	1.24E+01	2.44E+05	3.26E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.26E+47	2	1.31E+01	4.70E+05	3.26E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	756.3883	
u	0.0008	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.26E+47	2	6.53E-01	1.92E+00	3.26E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.26E+47	2	1.31E+00	3.69E+00	3.26E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.26E+47	2	1.96E+00	7.09E+00	3.26E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.26E+47	2	2.61E+00	1.36E+01	3.26E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.26E+47	2	3.26E+00	2.62E+01	3.26E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.26E+47	2	3.92E+00	5.03E+01	3.26E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.26E+47	2	4.57E+00	9.66E+01	3.26E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.26E+47	2	5.22E+00	1.86E+02	3.26E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.26E+47	2	5.88E+00	3.57E+02	3.26E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.26E+47	2	6.53E+00	6.85E+02	3.26E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.26E+47	2	7.18E+00	1.32E+03	3.26E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.26E+47	2	7.84E+00	2.53E+03	3.26E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.26E+47	2	8.49E+00	4.86E+03	3.26E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.26E+47	2	9.14E+00	9.34E+03	3.26E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.26E+47	2	9.79E+00	1.79E+04	3.26E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.26E+47	2	1.04E+01	3.45E+04	3.26E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.26E+47	2	1.11E+01	6.62E+04	3.26E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.26E+47	2	1.18E+01	1.27E+05	3.26E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.26E+47	2	1.24E+01	2.44E+05	3.26E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.26E+47	2	1.31E+01	4.70E+05	3.26E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

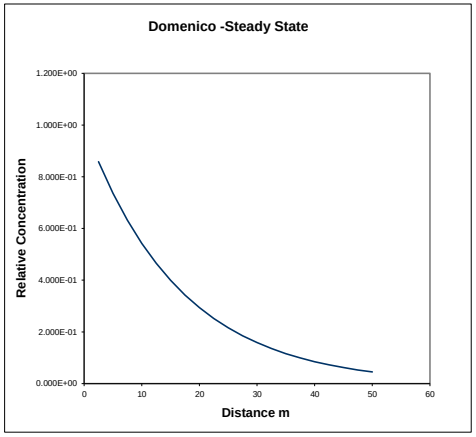
Contaminant **Aliphatic 6-8**

Input	Value	Units
C_T	1.500E+00	mg/l
DF	3.077E+00	
λ	6.546E-05	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



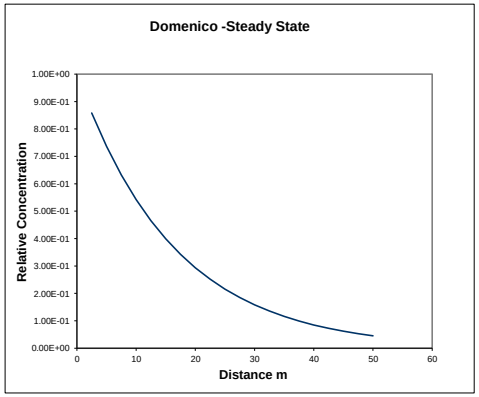
Calc **Value**

v	6.19E-01	m/d
Rc	7.56E+02	
u	8.19E-04	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

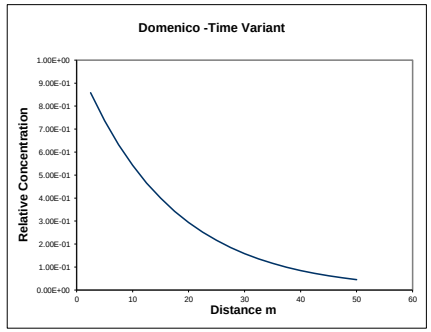
DOMENICO (TIME VARIANT)

Contaminant **Aliphatic 6-8**

Input	Value	Units
C_T	1.5	mg/l
DF	3.0774	
λ	6.546E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	3.536E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

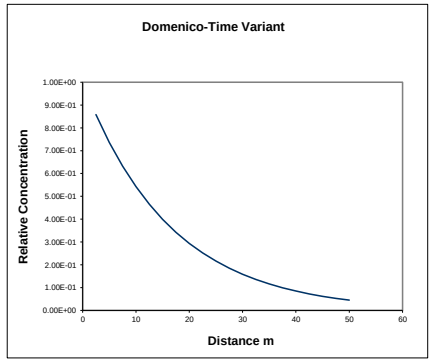
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.26E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.26E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.26E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.26E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.26E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.26E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.26E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.26E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.26E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.26E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.26E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.26E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.26E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.26E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.26E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.26E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.26E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.26E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.26E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.26E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calc	Value	
v	6.19E-01	m/d
Rc	7.56E+02	
u	8.19E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.26E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.26E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.26E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.26E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.26E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.26E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.26E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.26E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.26E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.26E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.26E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.26E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.26E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.26E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.26E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.26E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.26E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.26E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.26E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.26E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

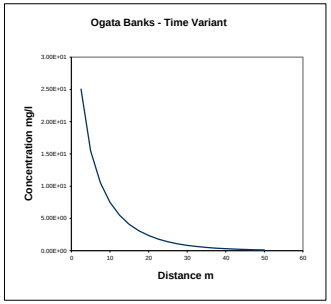
OGATA BANKS SOLUTION

Contaminant	Aliphatic 6-8	
Input	**Value**	**Units**
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

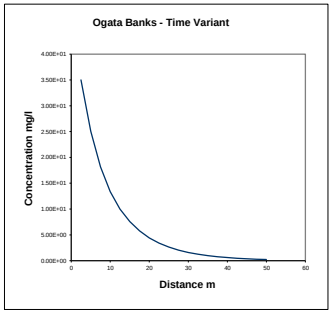
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	5.65	-2.1E-01	8.1E-01	-9.6E+47	2.000	7.1E-01	2.0E+00	9.6E+47	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.50E+01
2	5	5.65	-4.2E-01	6.6E-01	-9.6E+47	2.000	1.4E+00	4.1E+00	9.6E+47	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.55E+01
3	7.5	5.65	-6.3E-01	5.3E-01	-9.6E+47	2.000	2.1E+00	8.4E+00	9.6E+47	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.05E+01
4	10	5.65	-8.4E-01	4.3E-01	-9.6E+47	2.000	2.8E+00	1.7E+01	9.6E+47	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	7.51E+00
5	12.5	5.65	-1.0E+00	3.5E-01	-9.6E+47	2.000	3.5E+00	3.5E+01	9.6E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	5.49E+00
6	15	5.65	-1.3E+00	2.9E-01	-9.6E+47	2.000	4.3E+00	7.0E+01	9.6E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	4.09E+00
7	17.5	5.65	-1.5E+00	2.3E-01	-9.6E+47	2.000	5.0E+00	1.4E+02	9.6E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	3.09E+00
8	20	5.65	-1.7E+00	1.9E-01	-9.6E+47	2.000	5.7E+00	2.9E+02	9.6E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	2.35E+00
9	22.5	5.65	-1.9E+00	1.5E-01	-9.6E+47	2.000	6.4E+00	5.9E+02	9.6E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	1.80E+00
10	25	5.65	-2.1E+00	1.2E-01	-9.6E+47	2.000	7.1E+00	1.2E+03	9.6E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.39E+00
11	27.5	5.65	-2.3E+00	1.0E-01	-9.6E+47	2.000	7.8E+00	2.4E+03	9.6E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	1.07E+00
12	30	5.65	-2.5E+00	8.2E-02	-9.6E+47	2.000	8.5E+00	4.9E+03	9.6E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	8.33E-01
13	32.5	5.65	-2.7E+00	6.6E-02	-9.6E+47	2.000	9.2E+00	1.0E+04	9.6E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	6.49E-01
14	35	5.65	-2.9E+00	5.4E-02	-9.6E+47	2.000	9.9E+00	2.0E+04	9.6E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	5.06E-01
15	37.5	5.65	-3.1E+00	4.4E-02	-9.6E+47	2.000	1.1E+01	4.1E+04	9.6E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	3.96E-01
16	40	5.65	-3.3E+00	3.5E-02	-9.6E+47	2.000	1.1E+01	8.4E+04	9.6E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	3.10E-01
17	42.5	5.65	-3.5E+00	2.9E-02	-9.6E+47	2.000	1.2E+01	1.7E+05	9.6E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	2.44E-01
18	45	5.65	-3.8E+00	2.3E-02	-9.6E+47	2.000	1.3E+01	3.5E+05	9.6E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.91E-01
19	47.5	5.65	-4.0E+00	1.9E-02	-9.6E+47	2.000	1.3E+01	7.1E+05	9.6E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.51E-01
20	50	5.65	-4.2E+00	1.5E-02	-9.6E+47	2.000	1.4E+01	1.4E+06	9.6E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	1.19E-01



Calc	Value	
v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	5.65	-2.1E-01	8.1E-01	-9.6E+47	2.000	7.1E-01	2.0E+00	9.6E+47	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	3.50E+01
2	5	5.65	-4.2E-01	6.6E-01	-9.6E+47	2.000	1.4E+00	4.1E+00	9.6E+47	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	2.51E+01
3	7.5	5.65	-6.3E-01	5.3E-01	-9.6E+47	2.000	2.1E+00	8.4E+00	9.6E+47	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.82E+01
4	10	5.65	-8.4E-01	4.3E-01	-9.6E+47	2.000	2.8E+00	1.7E+01	9.6E+47	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.34E+01
5	12.5	5.65	-1.0E+00	3.5E-01	-9.6E+47	2.000	3.5E+00	3.5E+01	9.6E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	1.00E+01
6	15	5.65	-1.3E+00	2.9E-01	-9.6E+47	2.000	4.3E+00	7.0E+01	9.6E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	7.56E+00
7	17.5	5.65	-1.5E+00	2.3E-01	-9.6E+47	2.000	5.0E+00	1.4E+02	9.6E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	5.77E+00
8	20	5.65	-1.7E+00	1.9E-01	-9.6E+47	2.000	5.7E+00	2.9E+02	9.6E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	4.42E+00
9	22.5	5.65	-1.9E+00	1.5E-01	-9.6E+47	2.000	6.4E+00	5.9E+02	9.6E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	3.41E+00
10	25	5.65	-2.1E+00	1.2E-01	-9.6E+47	2.000	7.1E+00	1.2E+03	9.6E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	2.64E+00
11	27.5	5.65	-2.3E+00	1.0E-01	-9.6E+47	2.000	7.8E+00	2.4E+03	9.6E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	2.05E+00
12	30	5.65	-2.5E+00	8.2E-02	-9.6E+47	2.000	8.5E+00	4.9E+03	9.6E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.60E+00
13	32.5	5.65	-2.7E+00	6.6E-02	-9.6E+47	2.000	9.2E+00	1.0E+04	9.6E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.25E+00
14	35	5.65	-2.9E+00	5.4E-02	-9.6E+47	2.000	9.9E+00	2.0E+04	9.6E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	9.78E-01
15	37.5	5.65	-3.1E+00	4.4E-02	-9.6E+47	2.000	1.1E+01	4.1E+04	9.6E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	7.67E-01
16	40	5.65	-3.3E+00	3.5E-02	-9.6E+47	2.000	1.1E+01	8.4E+04	9.6E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	6.02E-01
17	42.5	5.65	-3.5E+00	2.9E-02	-9.6E+47	2.000	1.2E+01	1.7E+05	9.6E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	4.73E-01
18	45	5.65	-3.8E+00	2.3E-02	-9.6E+47	2.000	1.3E+01	3.5E+05	9.6E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.73E-01
19	47.5	5.65	-4.0E+00	1.9E-02	-9.6E+47	2.000	1.3E+01	7.1E+05	9.6E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	2.94E-01
20	50	5.65	-4.2E+00	1.5E-02	-9.6E+47	2.000	1.4E+01	1.4E+06	9.6E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	2.32E-01



Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

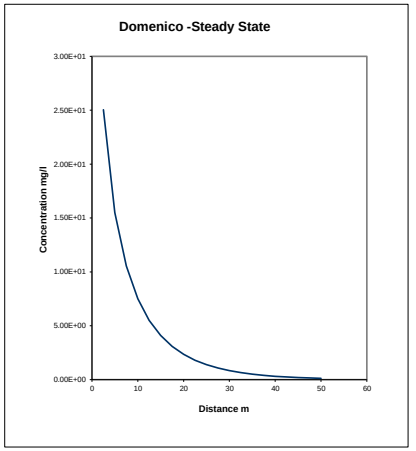
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant **Aliphatic 6-8**

Input	Value	Units
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	11.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.50E+01
2	5	11.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.55E+01
3	7.5	11.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.05E+01
4	10	11.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	7.51E+00
5	12.5	11.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	5.49E+00
6	15	11.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	4.09E+00
7	17.5	11.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	3.09E+00
8	20	11.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	2.35E+00
9	22.5	11.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	1.80E+00
10	25	11.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.39E+00
11	27.5	11.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	1.07E+00
12	30	11.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	8.33E-01
13	32.5	11.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	6.49E-01
14	35	11.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	5.06E-01
15	37.5	11.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	3.96E-01
16	40	11.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	3.10E-01
17	42.5	11.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	2.44E-01
18	45	11.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.91E-01
19	47.5	11.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.51E-01
20	50	11.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	1.19E-01



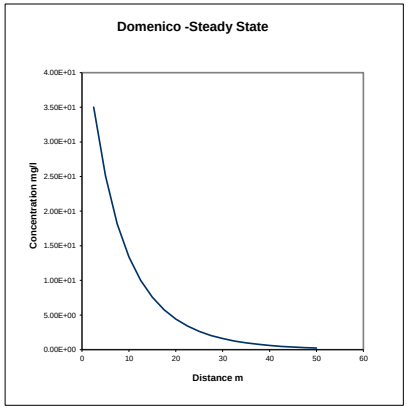
DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc **Value**

v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	11.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	3.50E+01
2	5	11.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	2.51E+01
3	7.5	11.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.82E+01
4	10	11.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.34E+01
5	12.5	11.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	1.00E+01
6	15	11.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	7.56E+00
7	17.5	11.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	5.77E+00
8	20	11.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	4.42E+00
9	22.5	11.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	3.41E+00
10	25	11.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	2.64E+00
11	27.5	11.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	2.05E+00
12	30	11.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.60E+00
13	32.5	11.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.25E+00
14	35	11.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	9.78E-01
15	37.5	11.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	7.67E-01
16	40	11.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	6.02E-01
17	42.5	11.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	4.73E-01
18	45	11.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.73E-01
19	47.5	11.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	2.94E-01
20	50	11.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	2.32E-01



Date:	13.07.2021
Version:	1

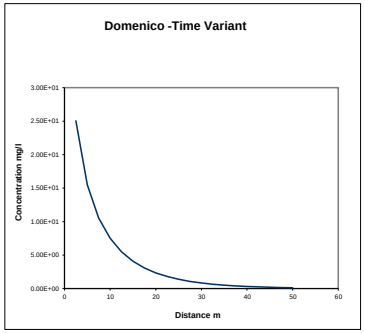
DOMENICO (TIME VARIANT)

Contaminant	Aliphatic 6-8	
Input	**Value**	**Units**
C_T	1.5	mg/l
Co	4.52E+01	mg/l
λ	6.54E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	3.54E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

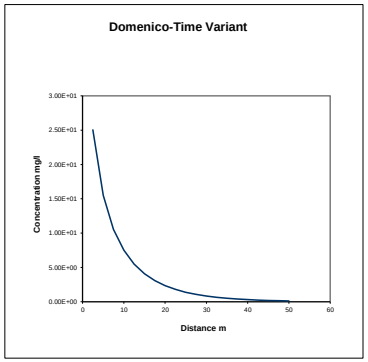
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	5.65	-2.09E-01	8.12E-01	-9.65E+47	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.50E+01
2	5	5.65	-4.18E-01	6.59E-01	-9.65E+47	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.55E+01
3	7.5	5.65	-6.26E-01	5.35E-01	-9.65E+47	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.05E+01
4	10	5.65	-8.35E-01	4.34E-01	-9.65E+47	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	7.51E+00
5	12.5	5.65	-1.04E+00	3.52E-01	-9.65E+47	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	5.49E+00
6	15	5.65	-1.25E+00	2.86E-01	-9.65E+47	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	4.09E+00
7	17.5	5.65	-1.46E+00	2.32E-01	-9.65E+47	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	3.09E+00
8	20	5.65	-1.67E+00	1.88E-01	-9.65E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	2.35E+00
9	22.5	5.65	-1.88E+00	1.53E-01	-9.65E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	1.80E+00
10	25	5.65	-2.09E+00	1.24E-01	-9.65E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.39E+00
11	27.5	5.65	-2.30E+00	1.01E-01	-9.65E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	1.07E+00
12	30	5.65	-2.51E+00	8.16E-02	-9.65E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	8.33E-01
13	32.5	5.65	-2.71E+00	6.62E-02	-9.65E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	6.49E-01
14	35	5.65	-2.92E+00	5.38E-02	-9.65E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	5.06E-01
15	37.5	5.65	-3.13E+00	4.36E-02	-9.65E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	3.96E-01
16	40	5.65	-3.34E+00	3.54E-02	-9.65E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	3.10E-01
17	42.5	5.65	-3.55E+00	2.87E-02	-9.65E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	2.44E-01
18	45	5.65	-3.76E+00	2.33E-02	-9.65E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.91E-01
19	47.5	5.65	-3.97E+00	1.89E-02	-9.65E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.51E-01
20	50	5.65	-4.18E+00	1.54E-02	-9.65E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	1.19E-01



Calc	Value	
v	4.18E-01	m/d
Rc	7.57E+02	
u	5.53E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	5.65	-2.09E-01	8.12E-01	-9.65E+47	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	3.50E+01
2	5	5.65	-4.18E-01	6.59E-01	-9.65E+47	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	2.51E+01
3	7.5	5.65	-6.26E-01	5.35E-01	-9.65E+47	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.82E+01
4	10	5.65	-8.35E-01	4.34E-01	-9.65E+47	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.34E+01
5	12.5	5.65	-1.04E+00	3.52E-01	-9.65E+47	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	1.00E+01
6	15	5.65	-1.25E+00	2.86E-01	-9.65E+47	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	7.56E+00
7	17.5	5.65	-1.46E+00	2.32E-01	-9.65E+47	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	5.77E+00
8	20	5.65	-1.67E+00	1.88E-01	-9.65E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	4.42E+00
9	22.5	5.65	-1.88E+00	1.53E-01	-9.65E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	3.41E+00
10	25	5.65	-2.09E+00	1.24E-01	-9.65E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	2.64E+00
11	27.5	5.65	-2.30E+00	1.01E-01	-9.65E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	2.05E+00
12	30	5.65	-2.51E+00	8.16E-02	-9.65E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.60E+00
13	32.5	5.65	-2.71E+00	6.62E-02	-9.65E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.25E+00
14	35	5.65	-2.92E+00	5.38E-02	-9.65E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	9.78E-01
15	37.5	5.65	-3.13E+00	4.36E-02	-9.65E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	7.67E-01
16	40	5.65	-3.34E+00	3.54E-02	-9.65E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	6.02E-01
17	42.5	5.65	-3.55E+00	2.87E-02	-9.65E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	4.73E-01
18	45	5.65	-3.76E+00	2.33E-02	-9.65E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.73E-01
19	47.5	5.65	-3.97E+00	1.89E-02	-9.65E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	2.94E-01
20	50	5.65	-4.18E+00	1.54E-02	-9.65E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	2.32E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aliphatic 8-10			
Target Concentration (C_T)	0.3	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aliphatic 8-10**		
Target concentration	C_T	**0.3**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	4.15E+01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	3.02E+04	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**2.81E+02**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**8.49E+01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.3	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aliphatic 8-10**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.3** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**9.23E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		2.61E+02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aliphatic 8-10		from Level 1
Target Concentration	C_T	0.3	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: **Apply degradation rate to dissolved pollutants only**

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		234	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.81E+02	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	6.00E+03	fraction
Decay rate used	λ	8.25E-06	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	1.03E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	8.26E-01	mg/l

Remedial Targets

Level 3 Remedial Target	**2.04E+01**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	5.77E+03	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.02E+04	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 2.81E+02 — l/kg

Define dispersivity (click brown cell and use pull down list)

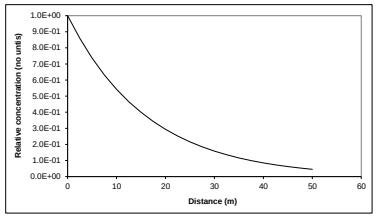
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	2.69E-01
2.5	8.58E-01	2.30E-01
5.0	7.36E-01	1.98E-01
7.5	6.32E-01	1.70E-01
10.0	5.42E-01	1.46E-01
12.5	4.65E-01	1.25E-01
15.0	3.99E-01	1.07E-01
17.5	3.43E-01	9.20E-02
20.0	2.94E-01	7.89E-02
22.5	2.52E-01	6.77E-02
25.0	2.16E-01	5.80E-02
27.5	1.85E-01	4.97E-02
30.0	1.58E-01	4.26E-02
32.5	1.36E-01	3.64E-02
35.0	1.16E-01	3.12E-02
37.5	9.93E-02	2.67E-02
40.0	8.49E-02	2.28E-02
42.5	7.26E-02	1.95E-02
45.0	6.21E-02	1.67E-02
47.5	5.30E-02	1.42E-02
50.0	4.53E-02	1.22E-02

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

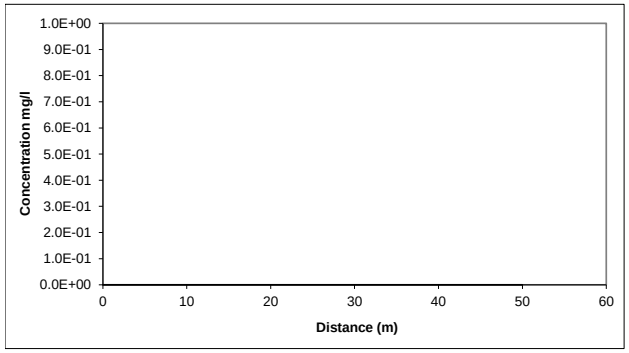
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	4.15E+01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	2.81E+02	l/kg
Factor (partitioning between soil and water)		2.83E+02	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aliphatic 8-10		from Level 1
Target Concentration	C_T	3.00E-01	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.08E+01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.81E+02	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	6.00E+03	fraction
Decay rate used	λ	8.25E-06	d^{-1}
Rate of contaminant flow due to retardation	u	6.97E-05	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.53E-02	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**5.86E+01**	**mg/l**
Domenico - Steady state			
Distance to compliance point		**50**	**m**
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**5.53E-02**	**mg/l**

For comparison with measured groundwater concentration.

Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	3.02E+04	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	2.81E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

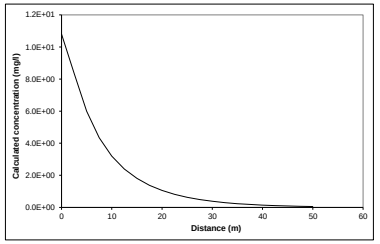
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.1E+01
2.5	8.37E+00
5.0	5.99E+00
7.5	4.34E+00
10.0	3.20E+00
12.5	2.39E+00
15.0	1.81E+00
17.5	1.38E+00
20.0	1.06E+00
22.5	8.15E-01
25.0	6.31E-01
27.5	4.91E-01
30.0	3.82E-01
32.5	2.99E-01
35.0	2.34E-01
37.5	1.83E-01
40.0	1.44E-01
42.5	1.13E-01
45.0	8.90E-02
47.5	7.02E-02
50.0	5.53E-02

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aliphatic 8-10**

Parameter	Value	Units
(carried over from input sheet)		
C_T	3.00E-01	mg/l
Kd	2.81E+02	l/kg
foc	9.30E-03	fraction
koc	3.02E+04	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	4.15E+01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			2.81E+02	l/kg

Calculated Remedial Target	**8.49E+01**	**mg/kg**	**for**	**Aliphatic 8-10**

Factor (partitioning between soil and water) 2.83E+02

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aliphatic 8-10**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	3.00E-01	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

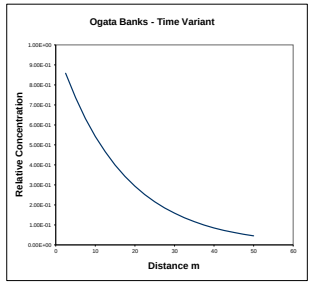
OGATA BANKS SOLUTION

Contaminant **Aliphatic 8-10**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	3.000E-01	mg/l
DF	3.077E+00	
λ	8.250E-06	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.809E+02	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

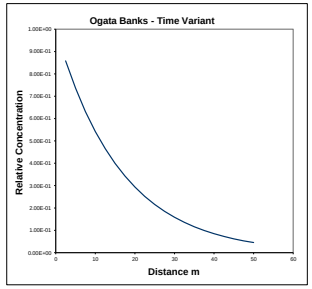
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-1.16E+47	2	6.53E-01	1.92E+00	1.16E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-1.16E+47	2	1.31E+00	3.69E+00	1.16E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-1.16E+47	2	1.96E+00	7.09E+00	1.16E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-1.16E+47	2	2.61E+00	1.36E+01	1.16E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-1.16E+47	2	3.26E+00	2.62E+01	1.16E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-1.16E+47	2	3.92E+00	5.03E+01	1.16E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-1.16E+47	2	4.57E+00	9.66E+01	1.16E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-1.16E+47	2	5.22E+00	1.86E+02	1.16E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-1.16E+47	2	5.88E+00	3.57E+02	1.16E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-1.16E+47	2	6.53E+00	6.85E+02	1.16E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-1.16E+47	2	7.18E+00	1.32E+03	1.16E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-1.16E+47	2	7.84E+00	2.53E+03	1.16E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-1.16E+47	2	8.49E+00	4.86E+03	1.16E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-1.16E+47	2	9.14E+00	9.34E+03	1.16E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-1.16E+47	2	9.79E+00	1.79E+04	1.16E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-1.16E+47	2	1.04E+01	3.45E+04	1.16E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-1.16E+47	2	1.11E+01	6.62E+04	1.16E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-1.16E+47	2	1.18E+01	1.27E+05	1.16E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-1.16E+47	2	1.24E+01	2.44E+05	1.16E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-1.16E+47	2	1.31E+01	4.70E+05	1.16E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	6000.9922	
u	0.0001	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-1.16E+47	2	6.53E-01	1.92E+00	1.16E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-1.16E+47	2	1.31E+00	3.69E+00	1.16E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-1.16E+47	2	1.96E+00	7.09E+00	1.16E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-1.16E+47	2	2.61E+00	1.36E+01	1.16E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-1.16E+47	2	3.26E+00	2.62E+01	1.16E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-1.16E+47	2	3.92E+00	5.03E+01	1.16E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-1.16E+47	2	4.57E+00	9.66E+01	1.16E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-1.16E+47	2	5.22E+00	1.86E+02	1.16E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-1.16E+47	2	5.88E+00	3.57E+02	1.16E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-1.16E+47	2	6.53E+00	6.85E+02	1.16E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-1.16E+47	2	7.18E+00	1.32E+03	1.16E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-1.16E+47	2	7.84E+00	2.53E+03	1.16E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-1.16E+47	2	8.49E+00	4.86E+03	1.16E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-1.16E+47	2	9.14E+00	9.34E+03	1.16E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-1.16E+47	2	9.79E+00	1.79E+04	1.16E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-1.16E+47	2	1.04E+01	3.45E+04	1.16E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-1.16E+47	2	1.11E+01	6.62E+04	1.16E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-1.16E+47	2	1.18E+01	1.27E+05	1.16E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-1.16E+47	2	1.24E+01	2.44E+05	1.16E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-1.16E+47	2	1.31E+01	4.70E+05	1.16E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

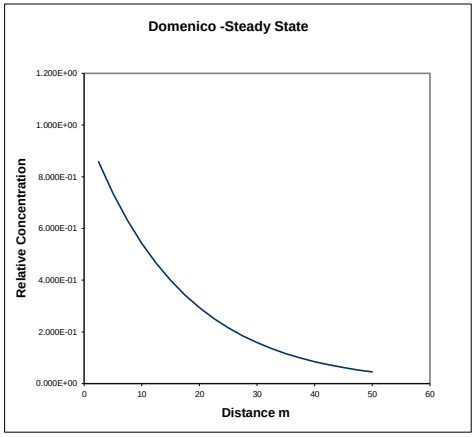
Contaminant **Aliphatic 8-10**

Input	Value	Units
C_T	3.000E-01	mg/l
DF	3.077E+00	
λ	8.250E-06	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.809E+02	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



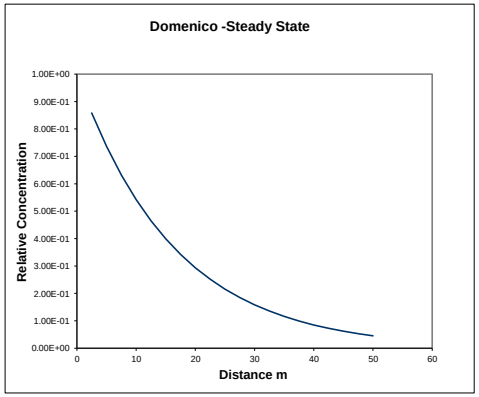
Calc **Value**

v	6.19E-01	m/d
Rc	6.00E+03	
u	1.03E-04	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

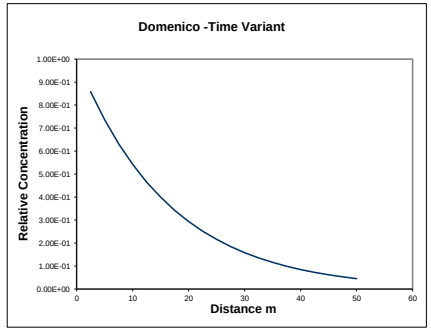
DOMENICO (TIME VARIANT)

Contaminant **Aliphatic 8-10**

Input	Value	Units
C_T	0.3	mg/l
DF	3.0774	
λ	8.250E-06	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.809E+02	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

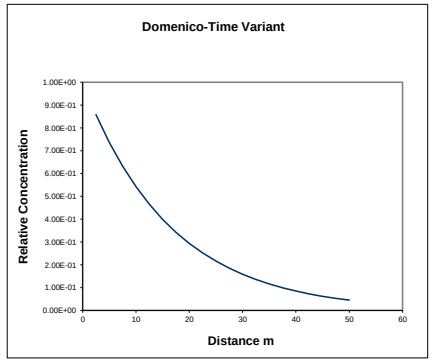
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-1.16E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-1.16E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-1.16E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-1.16E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-1.16E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-1.16E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-1.16E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-1.16E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-1.16E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-1.16E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-1.16E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-1.16E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-1.16E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-1.16E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-1.16E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-1.16E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-1.16E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-1.16E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-1.16E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-1.16E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calc	Value	
v	6.19E-01	m/d
Rc	6.00E+03	
u	1.03E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-1.16E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-1.16E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-1.16E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-1.16E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-1.16E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-1.16E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-1.16E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-1.16E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-1.16E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-1.16E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-1.16E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-1.16E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-1.16E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-1.16E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-1.16E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-1.16E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-1.16E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-1.16E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-1.16E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-1.16E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

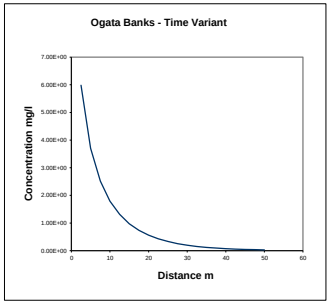
Contaminant	Aliphatic 8-10	
Input	**Value**	**Units**
C_T	0.3	mg/l
Co	1.08E+01	mg/l
λ	8.25E-06	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.81E+02	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	6.00E+03	
u	6.97E-05	m/d

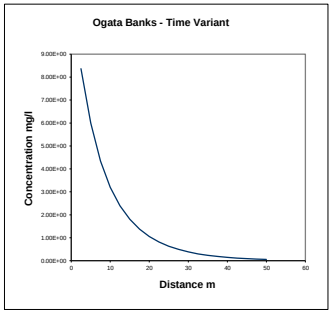
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	1.35	-2.1E-01	8.1E-01	-3.4E+47	2.000	7.1E-01	2.0E+00	3.4E+47	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	5.98E+00
2	5	1.35	-4.2E-01	6.6E-01	-3.4E+47	2.000	1.4E+00	4.1E+00	3.4E+47	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	3.70E+00
3	7.5	1.35	-6.3E-01	5.3E-01	-3.4E+47	2.000	2.1E+00	8.4E+00	3.4E+47	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	2.52E+00
4	10	1.35	-8.4E-01	4.3E-01	-3.4E+47	2.000	2.8E+00	1.7E+01	3.4E+47	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.79E+00
5	12.5	1.35	-1.0E+00	3.5E-01	-3.4E+47	2.000	3.5E+00	3.5E+01	3.4E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.31E+00
6	15	1.35	-1.3E+00	2.9E-01	-3.4E+47	2.000	4.3E+00	7.0E+01	3.4E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	9.78E-01
7	17.5	1.35	-1.5E+00	2.3E-01	-3.4E+47	2.000	5.0E+00	1.4E+02	3.4E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	7.37E-01
8	20	1.35	-1.7E+00	1.9E-01	-3.4E+47	2.000	5.7E+00	2.9E+02	3.4E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	5.61E-01
9	22.5	1.35	-1.9E+00	1.5E-01	-3.4E+47	2.000	6.4E+00	5.9E+02	3.4E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.30E-01
10	25	1.35	-2.1E+00	1.2E-01	-3.4E+47	2.000	7.1E+00	1.2E+03	3.4E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	3.31E-01
11	27.5	1.35	-2.3E+00	1.0E-01	-3.4E+47	2.000	7.8E+00	2.4E+03	3.4E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	2.56E-01
12	30	1.35	-2.5E+00	8.2E-02	-3.4E+47	2.000	8.5E+00	4.9E+03	3.4E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	1.99E-01
13	32.5	1.35	-2.7E+00	6.6E-02	-3.4E+47	2.000	9.2E+00	1.0E+04	3.4E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.55E-01
14	35	1.35	-2.9E+00	5.4E-02	-3.4E+47	2.000	9.9E+00	2.0E+04	3.4E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.21E-01
15	37.5	1.35	-3.1E+00	4.4E-02	-3.4E+47	2.000	1.1E+01	4.1E+04	3.4E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	9.46E-02
16	40	1.35	-3.3E+00	3.5E-02	-3.4E+47	2.000	1.1E+01	8.4E+04	3.4E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	7.42E-02
17	42.5	1.35	-3.5E+00	2.9E-02	-3.4E+47	2.000	1.2E+01	1.7E+05	3.4E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	5.82E-02
18	45	1.35	-3.8E+00	2.3E-02	-3.4E+47	2.000	1.3E+01	3.5E+05	3.4E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	4.57E-02
19	47.5	1.35	-4.0E+00	1.9E-02	-3.4E+47	2.000	1.3E+01	7.1E+05	3.4E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.60E-02
20	50	1.35	-4.2E+00	1.5E-02	-3.4E+47	2.000	1.4E+01	1.4E+06	3.4E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	2.84E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	1.35	-2.1E-01	8.1E-01	-3.4E+47	2.000	7.1E-01	2.0E+00	3.4E+47	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	8.37E+00
2	5	1.35	-4.2E-01	6.6E-01	-3.4E+47	2.000	1.4E+00	4.1E+00	3.4E+47	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	5.99E+00
3	7.5	1.35	-6.3E-01	5.3E-01	-3.4E+47	2.000	2.1E+00	8.4E+00	3.4E+47	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	4.34E+00
4	10	1.35	-8.4E-01	4.3E-01	-3.4E+47	2.000	2.8E+00	1.7E+01	3.4E+47	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	3.20E+00
5	12.5	1.35	-1.0E+00	3.5E-01	-3.4E+47	2.000	3.5E+00	3.5E+01	3.4E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.39E+00
6	15	1.35	-1.3E+00	2.9E-01	-3.4E+47	2.000	4.3E+00	7.0E+01	3.4E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	1.81E+00
7	17.5	1.35	-1.5E+00	2.3E-01	-3.4E+47	2.000	5.0E+00	1.4E+02	3.4E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.38E+00
8	20	1.35	-1.7E+00	1.9E-01	-3.4E+47	2.000	5.7E+00	2.9E+02	3.4E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.06E+00
9	22.5	1.35	-1.9E+00	1.5E-01	-3.4E+47	2.000	6.4E+00	5.9E+02	3.4E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	8.15E-01
10	25	1.35	-2.1E+00	1.2E-01	-3.4E+47	2.000	7.1E+00	1.2E+03	3.4E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	6.31E-01
11	27.5	1.35	-2.3E+00	1.0E-01	-3.4E+47	2.000	7.8E+00	2.4E+03	3.4E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	4.91E-01
12	30	1.35	-2.5E+00	8.2E-02	-3.4E+47	2.000	8.5E+00	4.9E+03	3.4E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	3.82E-01
13	32.5	1.35	-2.7E+00	6.6E-02	-3.4E+47	2.000	9.2E+00	1.0E+04	3.4E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	2.99E-01
14	35	1.35	-2.9E+00	5.4E-02	-3.4E+47	2.000	9.9E+00	2.0E+04	3.4E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.34E-01
15	37.5	1.35	-3.1E+00	4.4E-02	-3.4E+47	2.000	1.1E+01	4.1E+04	3.4E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	1.83E-01
16	40	1.35	-3.3E+00	3.5E-02	-3.4E+47	2.000	1.1E+01	8.4E+04	3.4E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.44E-01
17	42.5	1.35	-3.5E+00	2.9E-02	-3.4E+47	2.000	1.2E+01	1.7E+05	3.4E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.13E-01
18	45	1.35	-3.8E+00	2.3E-02	-3.4E+47	2.000	1.3E+01	3.5E+05	3.4E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	8.90E-02
19	47.5	1.35	-4.0E+00	1.9E-02	-3.4E+47	2.000	1.3E+01	7.1E+05	3.4E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	7.02E-02
20	50	1.35	-4.2E+00	1.5E-02	-3.4E+47	2.000	1.4E+01	1.4E+06	3.4E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.53E-02



Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

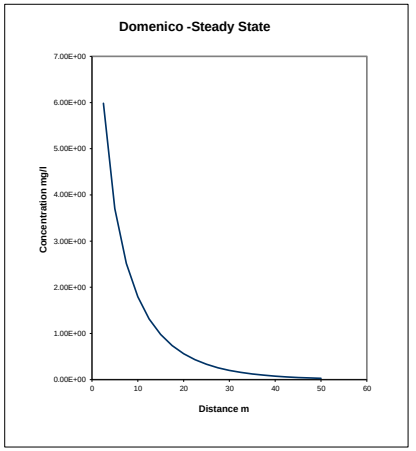
Contaminant **Aliphatic 8-10**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.3	mg/l
Co	1.08E+01	mg/l
λ	8.25E-06	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.81E+02	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	2.7	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	5.98E+00
2	5	2.7	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	3.70E+00
3	7.5	2.7	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	2.52E+00
4	10	2.7	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.79E+00
5	12.5	2.7	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.31E+00
6	15	2.7	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	9.78E-01
7	17.5	2.7	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	7.37E-01
8	20	2.7	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	5.61E-01
9	22.5	2.7	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.30E-01
10	25	2.7	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	3.31E-01
11	27.5	2.7	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	2.56E-01
12	30	2.7	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	1.99E-01
13	32.5	2.7	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.55E-01
14	35	2.7	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.21E-01
15	37.5	2.7	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	9.46E-02
16	40	2.7	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	7.42E-02
17	42.5	2.7	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	5.82E-02
18	45	2.7	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	4.57E-02
19	47.5	2.7	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.60E-02
20	50	2.7	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	2.84E-02



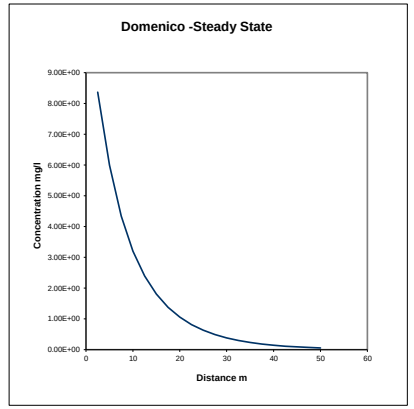
DOMENICO (STEADY STATE)

Calc **Value**

v	4.18E-01	m/d
Rc	6.00E+03	
u	6.97E-05	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	2.7	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	8.37E+00
2	5	2.7	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	5.99E+00
3	7.5	2.7	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	4.34E+00
4	10	2.7	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	3.20E+00
5	12.5	2.7	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.39E+00
6	15	2.7	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	1.81E+00
7	17.5	2.7	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.38E+00
8	20	2.7	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.06E+00
9	22.5	2.7	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	8.15E-01
10	25	2.7	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	6.31E-01
11	27.5	2.7	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	4.91E-01
12	30	2.7	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	3.82E-01
13	32.5	2.7	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	2.99E-01
14	35	2.7	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.34E-01
15	37.5	2.7	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	1.83E-01
16	40	2.7	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.44E-01
17	42.5	2.7	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.13E-01
18	45	2.7	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	8.90E-02
19	47.5	2.7	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	7.02E-02
20	50	2.7	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.53E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

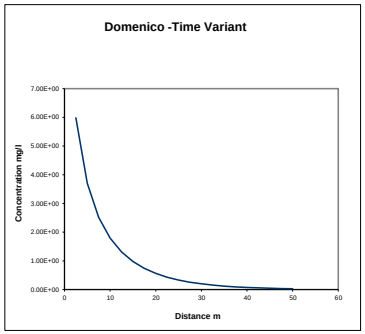
Contaminant **Aliphatic 8-10**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.3	mg/l
Co	1.08E+01	mg/l
λ	8.25E-06	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.81E+02	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	1.35	-2.09E-01	8.12E-01	-3.43E+47	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	5.98E+00
2	5	1.35	-4.18E-01	6.59E-01	-3.43E+47	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	3.70E+00
3	7.5	1.35	-6.26E-01	5.35E-01	-3.43E+47	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	2.52E+00
4	10	1.35	-8.35E-01	4.34E-01	-3.43E+47	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.79E+00
5	12.5	1.35	-1.04E+00	3.52E-01	-3.43E+47	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.31E+00
6	15	1.35	-1.25E+00	2.86E-01	-3.43E+47	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	9.78E-01
7	17.5	1.35	-1.46E+00	2.32E-01	-3.43E+47	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	7.37E-01
8	20	1.35	-1.67E+00	1.88E-01	-3.43E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	5.61E-01
9	22.5	1.35	-1.88E+00	1.53E-01	-3.43E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.30E-01
10	25	1.35	-2.09E+00	1.24E-01	-3.43E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	3.31E-01
11	27.5	1.35	-2.30E+00	1.01E-01	-3.43E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	2.56E-01
12	30	1.35	-2.51E+00	8.16E-02	-3.43E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	1.99E-01
13	32.5	1.35	-2.71E+00	6.62E-02	-3.43E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.55E-01
14	35	1.35	-2.92E+00	5.38E-02	-3.43E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.21E-01
15	37.5	1.35	-3.13E+00	4.36E-02	-3.43E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	9.46E-02
16	40	1.35	-3.34E+00	3.54E-02	-3.43E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	7.42E-02
17	42.5	1.35	-3.55E+00	2.87E-02	-3.43E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	5.82E-02
18	45	1.35	-3.76E+00	2.33E-02	-3.43E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	4.57E-02
19	47.5	1.35	-3.97E+00	1.89E-02	-3.43E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.60E-02
20	50	1.35	-4.18E+00	1.54E-02	-3.43E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	2.84E-02

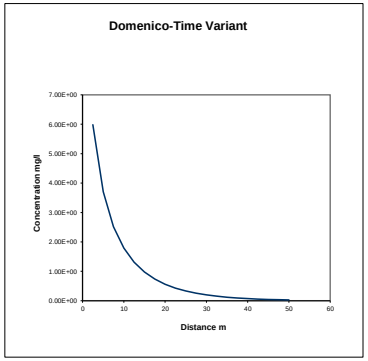


Calc **Value**

v	4.18E-01	m/d
Rc	6.00E+03	
u	6.97E-05	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	1.35	-2.09E-01	8.12E-01	-3.43E+47	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	8.37E+00
2	5	1.35	-4.18E-01	6.59E-01	-3.43E+47	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	5.99E+00
3	7.5	1.35	-6.26E-01	5.35E-01	-3.43E+47	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	4.34E+00
4	10	1.35	-8.35E-01	4.34E-01	-3.43E+47	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	3.20E+00
5	12.5	1.35	-1.04E+00	3.52E-01	-3.43E+47	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.39E+00
6	15	1.35	-1.25E+00	2.86E-01	-3.43E+47	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	1.81E+00
7	17.5	1.35	-1.46E+00	2.32E-01	-3.43E+47	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.38E+00
8	20	1.35	-1.67E+00	1.88E-01	-3.43E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.06E+00
9	22.5	1.35	-1.88E+00	1.53E-01	-3.43E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	8.15E-01
10	25	1.35	-2.09E+00	1.24E-01	-3.43E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	6.31E-01
11	27.5	1.35	-2.30E+00	1.01E-01	-3.43E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	4.91E-01
12	30	1.35	-2.51E+00	8.16E-02	-3.43E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	3.82E-01
13	32.5	1.35	-2.71E+00	6.62E-02	-3.43E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	2.99E-01
14	35	1.35	-2.92E+00	5.38E-02	-3.43E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.34E-01
15	37.5	1.35	-3.13E+00	4.36E-02	-3.43E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	1.83E-01
16	40	1.35	-3.34E+00	3.54E-02	-3.43E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.44E-01
17	42.5	1.35	-3.55E+00	2.87E-02	-3.43E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.13E-01
18	45	1.35	-3.76E+00	2.33E-02	-3.43E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	8.90E-02
19	47.5	1.35	-3.97E+00	1.89E-02	-3.43E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	7.02E-02
20	50	1.35	-4.18E+00	1.54E-02	-3.43E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.53E-02



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aliphatic 12-16			
Target Concentration (C_T)	0.3	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aliphatic 12-16**		
Target concentration	**C_T**	**0.3**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.71E+02	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	5.37E+06	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.99E+04**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.50E+04**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.3	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aliphatic 12-16**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.3** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**9.23E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.61E+04	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aliphatic 12-16		from Level 1
Target Concentration	C_T	0.3	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		616	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	4.10E+01	days	R2174c-R10-App A
Calculated decay rate	λ	1.69E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.99E+04	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.07E+06	fraction
Decay rate used	λ	1.58E-08	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	5.81E-07	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	2.86E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**3.49E+00**	**fraction**
Calculated soil leachate concentration	Co	1.23E-02	mg/l

Remedial Targets

Level 3 Remedial Target	**3.23E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.61E+05	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**2.86E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	5.37E+06	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 4.99E+04 — l/kg

Define dispersivity (click brown cell and use pull down list)

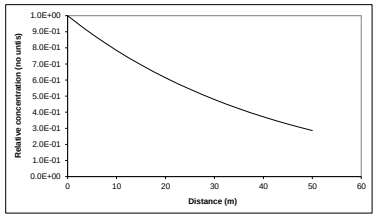
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	4.01E-03
2.5	9.41E-01	3.77E-03
5.0	8.85E-01	3.55E-03
7.5	8.33E-01	3.34E-03
10.0	7.84E-01	3.14E-03
12.5	7.38E-01	2.96E-03
15.0	6.94E-01	2.78E-03
17.5	6.53E-01	2.62E-03
20.0	6.14E-01	2.46E-03
22.5	5.78E-01	2.31E-03
25.0	5.43E-01	2.18E-03
27.5	5.10E-01	2.04E-03
30.0	4.79E-01	1.92E-03
32.5	4.50E-01	1.80E-03
35.0	4.22E-01	1.69E-03
37.5	3.96E-01	1.59E-03
40.0	3.71E-01	1.49E-03
42.5	3.48E-01	1.39E-03
45.0	3.26E-01	1.31E-03
47.5	3.06E-01	1.22E-03
50.0	2.86E-01	1.15E-03

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

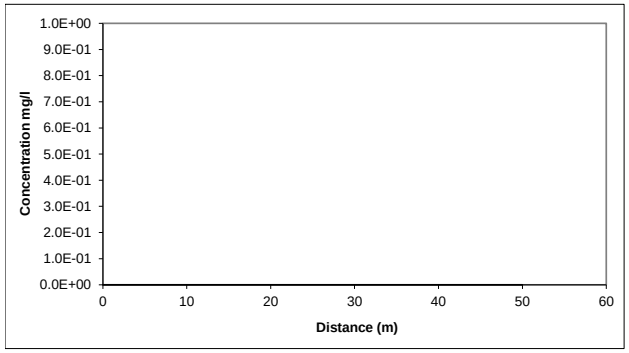
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.71E+02	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	4.99E+04	l/kg
Factor (partitioning between soil and water)		5.00E+04	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	3.49E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aliphatic 12-16		from Level 1
Target Concentration	C_T	3.00E-01	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.00E-02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	4.10E+01	days	R2174c-R10-App A
Calculated decay rate	λ	1.69E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.99E+04	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	1.07E+06	fraction
Decay rate used	λ	1.58E-08	d^{-1}
Rate of contaminant flow due to retardation	u	3.92E-07	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.95E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.68E+01**	

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	5.37E+06	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.99E+04	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

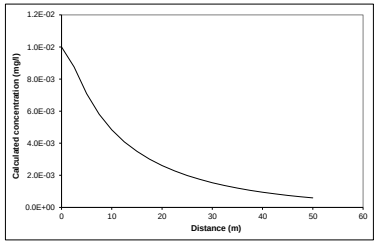
Remedial Targets

Remedial Target		**5.04E+00**	**mg/l**
Domenico - Steady state			
Distance to compliance point		**50**	**m**
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**5.95E-04**	**mg/l**

For comparison with measured groundwater concentration.

Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.0E-02
2.5	8.76E-03
5.0	7.09E-03
7.5	5.80E-03
10.0	4.84E-03
12.5	4.09E-03
15.0	3.49E-03
17.5	3.01E-03
20.0	2.61E-03
22.5	2.27E-03
25.0	1.99E-03
27.5	1.75E-03
30.0	1.54E-03
32.5	1.36E-03
35.0	1.20E-03
37.5	1.07E-03
40.0	9.47E-04
42.5	8.42E-04
45.0	7.49E-04
47.5	6.67E-04
50.0	5.95E-04

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aliphatic 12-16**

Parameter	Value	Units
(carried over from input sheet)		
C_T	3.00E-01	mg/l
Kd	4.99E+04	l/kg
foc	9.30E-03	fraction
koc	5.37E+06	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.71E+02	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 4.99E+04 l/kg

Calculated Remedial Target	**1.50E+04 mg/kg**	**for Aliphatic 12-16**

Factor (partitioning between soil and water) 5.00E+04

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aliphatic 12-16**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	3.00E-01	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

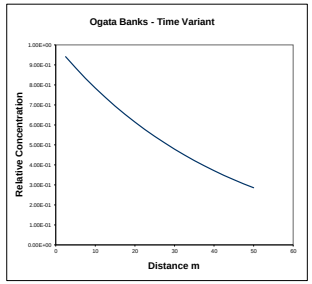
OGATA BANKS SOLUTION

Contaminant **Aliphatic 12-16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	3.000E-01	mg/l
DF	3.077E+00	
λ	1.584E-08	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.994E+04	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

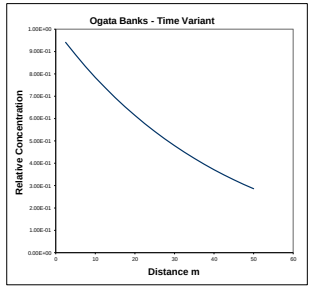
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.08E-02	9.41E-01	-6.70E+45	2	5.61E-01	1.75E+00	6.70E+45	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.41E-01
2	5	0.13	-1.22E-01	8.85E-01	-6.70E+45	2	1.12E+00	3.07E+00	6.70E+45	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.85E-01
3	7.5	0.13	-1.82E-01	8.33E-01	-6.70E+45	2	1.68E+00	5.38E+00	6.70E+45	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.33E-01
4	10	0.13	-2.43E-01	7.84E-01	-6.70E+45	2	2.24E+00	9.42E+00	6.70E+45	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.84E-01
5	12.5	0.13	-3.04E-01	7.38E-01	-6.70E+45	2	2.80E+00	1.65E+01	6.70E+45	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	7.38E-01
6	15	0.13	-3.65E-01	6.94E-01	-6.70E+45	2	3.36E+00	2.89E+01	6.70E+45	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	6.94E-01
7	17.5	0.13	-4.26E-01	6.53E-01	-6.70E+45	2	3.93E+00	5.07E+01	6.70E+45	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	6.53E-01
8	20	0.13	-4.87E-01	6.15E-01	-6.70E+45	2	4.49E+00	8.88E+01	6.70E+45	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.14E-01
9	22.5	0.13	-5.47E-01	5.78E-01	-6.70E+45	2	5.05E+00	1.56E+02	6.70E+45	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	5.78E-01
10	25	0.13	-6.08E-01	5.44E-01	-6.70E+45	2	5.61E+00	2.73E+02	6.70E+45	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	5.43E-01
11	27.5	0.13	-6.69E-01	5.12E-01	-6.70E+45	2	6.17E+00	4.78E+02	6.70E+45	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	5.10E-01
12	30	0.13	-7.30E-01	4.82E-01	-6.70E+45	2	6.73E+00	8.37E+02	6.70E+45	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	4.79E-01
13	32.5	0.13	-7.91E-01	4.54E-01	-6.70E+45	2	7.29E+00	1.47E+03	6.70E+45	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	4.50E-01
14	35	0.13	-8.52E-01	4.27E-01	-6.70E+45	2	7.85E+00	2.57E+03	6.70E+45	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	4.22E-01
15	37.5	0.13	-9.12E-01	4.02E-01	-6.70E+45	2	8.41E+00	4.50E+03	6.70E+45	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	3.96E-01
16	40	0.13	-9.73E-01	3.78E-01	-6.70E+45	2	8.97E+00	7.89E+03	6.70E+45	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	3.71E-01
17	42.5	0.13	-1.03E+00	3.56E-01	-6.70E+45	2	9.53E+00	1.38E+04	6.70E+45	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	3.48E-01
18	45	0.13	-1.09E+00	3.35E-01	-6.70E+45	2	1.01E+01	2.42E+04	6.70E+45	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	3.26E-01
19	47.5	0.13	-1.16E+00	3.15E-01	-6.70E+45	2	1.07E+01	4.24E+04	6.70E+45	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	3.05E-01
20	50	0.13	-1.22E+00	2.96E-01	-6.70E+45	2	1.12E+01	7.43E+04	6.70E+45	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	2.86E-01



Calc	Value	
v	0.6195	m/d
Rc	1066985.3458	
u	0.0000	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.08E-02	9.41E-01	-6.70E+45	2	5.61E-01	1.75E+00	6.70E+45	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.13	-1.22E-01	8.85E-01	-6.70E+45	2	1.12E+00	3.07E+00	6.70E+45	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.13	-1.82E-01	8.33E-01	-6.70E+45	2	1.68E+00	5.38E+00	6.70E+45	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.13	-2.43E-01	7.84E-01	-6.70E+45	2	2.24E+00	9.42E+00	6.70E+45	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.13	-3.04E-01	7.38E-01	-6.70E+45	2	2.80E+00	1.65E+01	6.70E+45	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.13	-3.65E-01	6.94E-01	-6.70E+45	2	3.36E+00	2.89E+01	6.70E+45	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.13	-4.26E-01	6.53E-01	-6.70E+45	2	3.93E+00	5.07E+01	6.70E+45	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.13	-4.87E-01	6.15E-01	-6.70E+45	2	4.49E+00	8.88E+01	6.70E+45	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.13	-5.47E-01	5.78E-01	-6.70E+45	2	5.05E+00	1.56E+02	6.70E+45	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.13	-6.08E-01	5.44E-01	-6.70E+45	2	5.61E+00	2.73E+02	6.70E+45	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.13	-6.69E-01	5.12E-01	-6.70E+45	2	6.17E+00	4.78E+02	6.70E+45	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.13	-7.30E-01	4.82E-01	-6.70E+45	2	6.73E+00	8.37E+02	6.70E+45	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.13	-7.91E-01	4.54E-01	-6.70E+45	2	7.29E+00	1.47E+03	6.70E+45	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.13	-8.52E-01	4.27E-01	-6.70E+45	2	7.85E+00	2.57E+03	6.70E+45	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.13	-9.12E-01	4.02E-01	-6.70E+45	2	8.41E+00	4.50E+03	6.70E+45	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.13	-9.73E-01	3.78E-01	-6.70E+45	2	8.97E+00	7.89E+03	6.70E+45	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.13	-1.03E+00	3.56E-01	-6.70E+45	2	9.53E+00	1.38E+04	6.70E+45	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.13	-1.09E+00	3.35E-01	-6.70E+45	2	1.01E+01	2.42E+04	6.70E+45	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.13	-1.16E+00	3.15E-01	-6.70E+45	2	1.07E+01	4.24E+04	6.70E+45	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.13	-1.22E+00	2.96E-01	-6.70E+45	2	1.12E+01	7.43E+04	6.70E+45	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	2.86E-01



Date:	13.07.2021
Version:	1

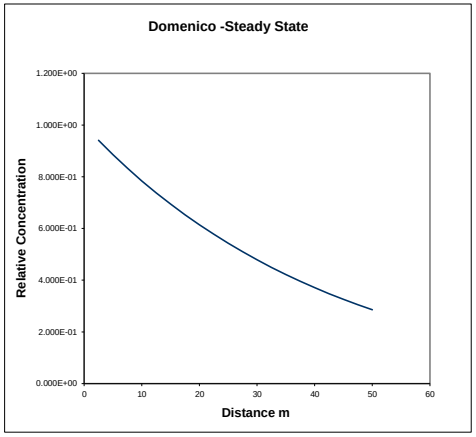
Contaminant **Aliphatic 12-16**

Input	Value	Units
C_T	3.000E-01	mg/l
DF	3.077E+00	
λ	1.584E-08	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.994E+04	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.08E-02	9.41E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.410E-01
2	5	0.25	-1.22E-01	8.85E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.855E-01
3	7.5	0.25	-1.82E-01	8.33E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.332E-01
4	10	0.25	-2.43E-01	7.84E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.840E-01
5	12.5	0.25	-3.04E-01	7.38E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	7.377E-01
6	15	0.25	-3.65E-01	6.94E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	6.941E-01
7	17.5	0.25	-4.26E-01	6.53E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	6.530E-01
8	20	0.25	-4.87E-01	6.15E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.142E-01
9	22.5	0.25	-5.47E-01	5.78E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	5.775E-01
10	25	0.25	-6.08E-01	5.44E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	5.428E-01
11	27.5	0.25	-6.69E-01	5.12E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	5.100E-01
12	30	0.25	-7.30E-01	4.82E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	4.789E-01
13	32.5	0.25	-7.91E-01	4.54E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	4.496E-01
14	35	0.25	-8.52E-01	4.27E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	4.219E-01
15	37.5	0.25	-9.12E-01	4.02E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	3.957E-01
16	40	0.25	-9.73E-01	3.78E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	3.710E-01
17	42.5	0.25	-1.03E+00	3.56E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	3.477E-01
18	45	0.25	-1.09E+00	3.35E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	3.258E-01
19	47.5	0.25	-1.16E+00	3.15E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	3.051E-01
20	50	0.25	-1.22E+00	2.96E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	2.857E-01

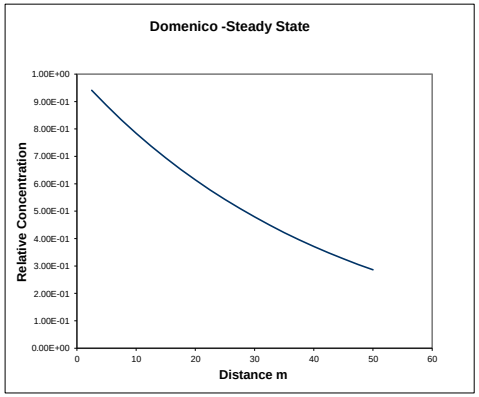


Calc	Value	
v	6.19E-01	m/d
Rc	1.07E+06	
u	5.81E-07	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.08E-02	9.41E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.25	-1.22E-01	8.85E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.25	-1.82E-01	8.33E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.25	-2.43E-01	7.84E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.25	-3.04E-01	7.38E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.25	-3.65E-01	6.94E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.25	-4.26E-01	6.53E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.25	-4.87E-01	6.15E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.25	-5.47E-01	5.78E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.25	-6.08E-01	5.44E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.25	-6.69E-01	5.12E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.25	-7.30E-01	4.82E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.25	-7.91E-01	4.54E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.25	-8.52E-01	4.27E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.25	-9.12E-01	4.02E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.25	-9.73E-01	3.78E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.25	-1.03E+00	3.56E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.25	-1.09E+00	3.35E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.25	-1.16E+00	3.15E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.25	-1.22E+00	2.96E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	2.86E-01



Date:	13.07.2021
Version:	1

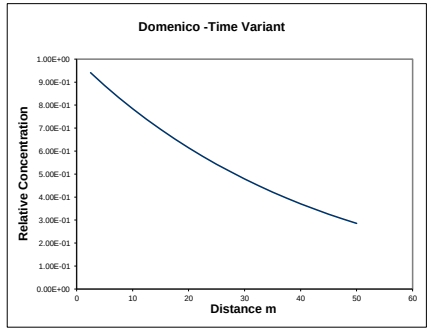
DOMENICO (TIME VARIANT)

Contaminant **Aliphatic 12-16**

Input	Value	Units
C_T	0.3	mg/l
DF	3.0774	
λ	1.584E-08	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.994E+04	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

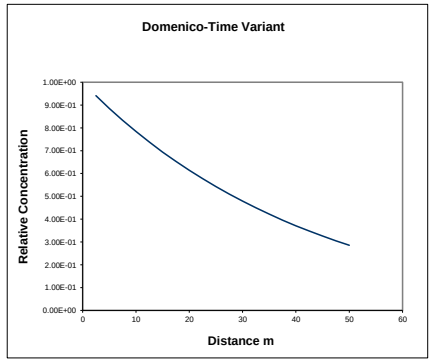
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-6.08E-02	9.41E-01	-6.70E+45	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.41E-01
2	5	0.125	-1.22E-01	8.85E-01	-6.70E+45	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.85E-01
3	7.5	0.125	-1.82E-01	8.33E-01	-6.70E+45	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.33E-01
4	10	0.125	-2.43E-01	7.84E-01	-6.70E+45	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.84E-01
5	12.5	0.125	-3.04E-01	7.38E-01	-6.70E+45	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	7.38E-01
6	15	0.125	-3.65E-01	6.94E-01	-6.70E+45	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	6.94E-01
7	17.5	0.125	-4.26E-01	6.53E-01	-6.70E+45	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	6.53E-01
8	20	0.125	-4.87E-01	6.15E-01	-6.70E+45	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	6.14E-01
9	22.5	0.125	-5.47E-01	5.78E-01	-6.70E+45	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	5.78E-01
10	25	0.125	-6.08E-01	5.44E-01	-6.70E+45	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	5.43E-01
11	27.5	0.125	-6.69E-01	5.12E-01	-6.70E+45	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	5.10E-01
12	30	0.125	-7.30E-01	4.82E-01	-6.70E+45	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	4.79E-01
13	32.5	0.125	-7.91E-01	4.54E-01	-6.70E+45	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	4.50E-01
14	35	0.125	-8.52E-01	4.27E-01	-6.70E+45	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	4.22E-01
15	37.5	0.125	-9.12E-01	4.02E-01	-6.70E+45	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	3.96E-01
16	40	0.125	-9.73E-01	3.78E-01	-6.70E+45	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	3.71E-01
17	42.5	0.125	-1.03E+00	3.56E-01	-6.70E+45	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	3.48E-01
18	45	0.125	-1.09E+00	3.35E-01	-6.70E+45	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	3.26E-01
19	47.5	0.125	-1.16E+00	3.15E-01	-6.70E+45	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	3.05E-01
20	50	0.125	-1.22E+00	2.96E-01	-6.70E+45	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	2.86E-01



Calc	Value	
v	6.19E-01	m/d
Rc	1.07E+06	
u	5.81E-07	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-6.08E-02	9.41E-01	-6.70E+45	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.125	-1.22E-01	8.85E-01	-6.70E+45	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.125	-1.82E-01	8.33E-01	-6.70E+45	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.125	-2.43E-01	7.84E-01	-6.70E+45	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.125	-3.04E-01	7.38E-01	-6.70E+45	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.125	-3.65E-01	6.94E-01	-6.70E+45	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.125	-4.26E-01	6.53E-01	-6.70E+45	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.125	-4.87E-01	6.15E-01	-6.70E+45	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.125	-5.47E-01	5.78E-01	-6.70E+45	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.125	-6.08E-01	5.44E-01	-6.70E+45	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.125	-6.69E-01	5.12E-01	-6.70E+45	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.125	-7.30E-01	4.82E-01	-6.70E+45	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.125	-7.91E-01	4.54E-01	-6.70E+45	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.125	-8.52E-01	4.27E-01	-6.70E+45	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.125	-9.12E-01	4.02E-01	-6.70E+45	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.125	-9.73E-01	3.78E-01	-6.70E+45	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.125	-1.03E+00	3.56E-01	-6.70E+45	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.125	-1.09E+00	3.35E-01	-6.70E+45	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.125	-1.16E+00	3.15E-01	-6.70E+45	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.125	-1.22E+00	2.96E-01	-6.70E+45	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	2.86E-01



Date:	13.07.2021
Version:	1

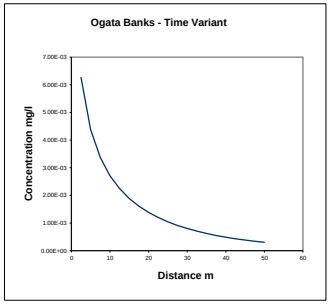
OGATA BANKS SOLUTION

Contaminant	Aliphatic 12-16

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.3	mg/l
Co	1.00E-02	mg/l
λ	1.58E-08	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.99E+04	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.00125	-8.6E-02	9.2E-01	-1.9E+46	2.000	5.9E-01	1.8E+00	1.9E+46	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	6.26E-03
2	5	0.00125	-1.7E-01	8.4E-01	-1.9E+46	2.000	1.2E+00	3.2E+00	1.9E+46	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	4.38E-03
3	7.5	0.00125	-2.6E-01	7.7E-01	-1.9E+46	2.000	1.8E+00	5.8E+00	1.9E+46	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	3.37E-03
4	10	0.00125	-3.4E-01	7.1E-01	-1.9E+46	2.000	2.3E+00	1.0E+01	1.9E+46	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	2.71E-03
5	12.5	0.00125	-4.3E-01	6.5E-01	-1.9E+46	2.000	2.9E+00	1.9E+01	1.9E+46	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	2.24E-03
6	15	0.00125	-5.2E-01	6.0E-01	-1.9E+46	2.000	3.5E+00	3.4E+01	1.9E+46	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.89E-03
7	17.5	0.00125	-6.0E-01	5.5E-01	-1.9E+46	2.000	4.1E+00	6.1E+01	1.9E+46	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.61E-03
8	20	0.00125	-6.9E-01	5.0E-01	-1.9E+46	2.000	4.7E+00	1.1E+02	1.9E+46	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	1.39E-03
9	22.5	0.00125	-7.8E-01	4.6E-01	-1.9E+46	2.000	5.3E+00	2.0E+02	1.9E+46	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	1.20E-03
10	25	0.00125	-8.6E-01	4.2E-01	-1.9E+46	2.000	5.9E+00	3.5E+02	1.9E+46	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.05E-03
11	27.5	0.00125	-9.5E-01	3.9E-01	-1.9E+46	2.000	6.4E+00	6.3E+02	1.9E+46	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	9.14E-04
12	30	0.00125	-1.0E+00	3.6E-01	-1.9E+46	2.000	7.0E+00	1.1E+03	1.9E+46	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	8.02E-04
13	32.5	0.00125	-1.1E+00	3.3E-01	-1.9E+46	2.000	7.6E+00	2.0E+03	1.9E+46	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	7.06E-04
14	35	0.00125	-1.2E+00	3.0E-01	-1.9E+46	2.000	8.2E+00	3.7E+03	1.9E+46	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	6.23E-04
15	37.5	0.00125	-1.3E+00	2.7E-01	-1.9E+46	2.000	8.8E+00	6.6E+03	1.9E+46	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	5.51E-04
16	40	0.00125	-1.4E+00	2.5E-01	-1.9E+46	2.000	9.4E+00	1.2E+04	1.9E+46	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	4.88E-04
17	42.5	0.00125	-1.5E+00	2.3E-01	-1.9E+46	2.000	1.0E+01	2.1E+04	1.9E+46	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	4.33E-04
18	45	0.00125	-1.6E+00	2.1E-01	-1.9E+46	2.000	1.1E+01	3.8E+04	1.9E+46	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	3.85E-04
19	47.5	0.00125	-1.6E+00	1.9E-01	-1.9E+46	2.000	1.1E+01	6.9E+04	1.9E+46	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.42E-04
20	50	0.00125	-1.7E+00	1.8E-01	-1.9E+46	2.000	1.2E+01	1.2E+05	1.9E+46	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.05E-04

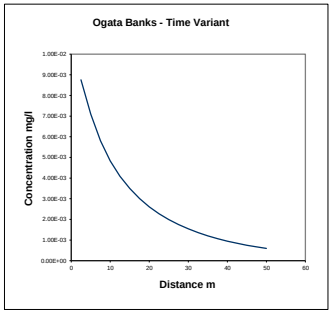


Vertical dispersion option Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	1.07E+06	
u	3.92E-07	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.00125	-8.6E-02	9.2E-01	-1.9E+46	2.000	5.9E-01	1.8E+00	1.9E+46	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	8.76E-03
2	5	0.00125	-1.7E-01	8.4E-01	-1.9E+46	2.000	1.2E+00	3.2E+00	1.9E+46	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	7.09E-03
3	7.5	0.00125	-2.6E-01	7.7E-01	-1.9E+46	2.000	1.8E+00	5.8E+00	1.9E+46	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	5.80E-03
4	10	0.00125	-3.4E-01	7.1E-01	-1.9E+46	2.000	2.3E+00	1.0E+01	1.9E+46	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	4.84E-03
5	12.5	0.00125	-4.3E-01	6.5E-01	-1.9E+46	2.000	2.9E+00	1.9E+01	1.9E+46	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	4.09E-03
6	15	0.00125	-5.2E-01	6.0E-01	-1.9E+46	2.000	3.5E+00	3.4E+01	1.9E+46	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	3.49E-03
7	17.5	0.00125	-6.0E-01	5.5E-01	-1.9E+46	2.000	4.1E+00	6.1E+01	1.9E+46	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	3.01E-03
8	20	0.00125	-6.9E-01	5.0E-01	-1.9E+46	2.000	4.7E+00	1.1E+02	1.9E+46	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	2.61E-03
9	22.5	0.00125	-7.8E-01	4.6E-01	-1.9E+46	2.000	5.3E+00	2.0E+02	1.9E+46	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	2.27E-03
10	25	0.00125	-8.6E-01	4.2E-01	-1.9E+46	2.000	5.9E+00	3.5E+02	1.9E+46	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	1.99E-03
11	27.5	0.00125	-9.5E-01	3.9E-01	-1.9E+46	2.000	6.4E+00	6.3E+02	1.9E+46	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.75E-03
12	30	0.00125	-1.0E+00	3.6E-01	-1.9E+46	2.000	7.0E+00	1.1E+03	1.9E+46	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.54E-03
13	32.5	0.00125	-1.1E+00	3.3E-01	-1.9E+46	2.000	7.6E+00	2.0E+03	1.9E+46	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.36E-03
14	35	0.00125	-1.2E+00	3.0E-01	-1.9E+46	2.000	8.2E+00	3.7E+03	1.9E+46	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	1.20E-03
15	37.5	0.00125	-1.3E+00	2.7E-01	-1.9E+46	2.000	8.8E+00	6.6E+03	1.9E+46	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	1.07E-03
16	40	0.00125	-1.4E+00	2.5E-01	-1.9E+46	2.000	9.4E+00	1.2E+04	1.9E+46	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	9.47E-04
17	42.5	0.00125	-1.5E+00	2.3E-01	-1.9E+46	2.000	1.0E+01	2.1E+04	1.9E+46	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	8.42E-04
18	45	0.00125	-1.6E+00	2.1E-01	-1.9E+46	2.000	1.1E+01	3.8E+04	1.9E+46	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	7.49E-04
19	47.5	0.00125	-1.6E+00	1.9E-01	-1.9E+46	2.000	1.1E+01	6.9E+04	1.9E+46	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.67E-04
20	50	0.00125	-1.7E+00	1.8E-01	-1.9E+46	2.000	1.2E+01	1.2E+05	1.9E+46	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.95E-04



Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

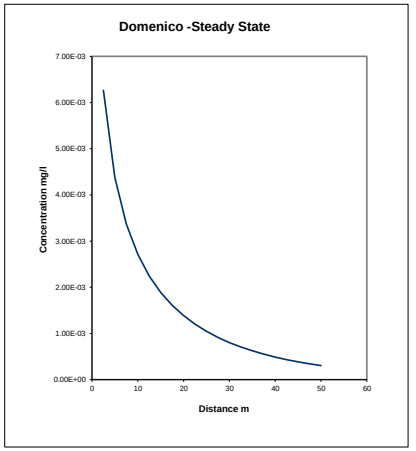
Contaminant **Aliphatic 12-16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.3	mg/l
Co	1.00E-02	mg/l
λ	1.58E-08	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.99E+04	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.0025	-8.62E-02	9.17E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	6.26E-03
2	5	0.0025	-1.72E-01	8.42E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	4.38E-03
3	7.5	0.0025	-2.59E-01	7.72E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	3.37E-03
4	10	0.0025	-3.45E-01	7.08E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	2.71E-03
5	12.5	0.0025	-4.31E-01	6.50E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	2.24E-03
6	15	0.0025	-5.17E-01	5.96E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.89E-03
7	17.5	0.0025	-6.03E-01	5.47E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.61E-03
8	20	0.0025	-6.90E-01	5.02E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	1.39E-03
9	22.5	0.0025	-7.76E-01	4.60E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	1.20E-03
10	25	0.0025	-8.62E-01	4.22E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.05E-03
11	27.5	0.0025	-9.48E-01	3.87E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	9.14E-04
12	30	0.0025	-1.03E+00	3.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	8.02E-04
13	32.5	0.0025	-1.12E+00	3.26E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	7.06E-04
14	35	0.0025	-1.21E+00	2.99E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	6.23E-04
15	37.5	0.0025	-1.29E+00	2.74E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	5.51E-04
16	40	0.0025	-1.38E+00	2.52E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	4.88E-04
17	42.5	0.0025	-1.47E+00	2.31E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	4.33E-04
18	45	0.0025	-1.55E+00	2.12E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	3.85E-04
19	47.5	0.0025	-1.64E+00	1.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.42E-04
20	50	0.0025	-1.72E+00	1.78E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.05E-04

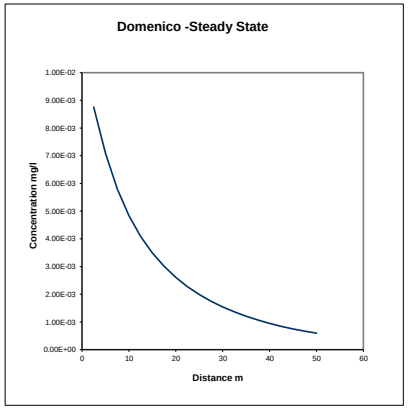


DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc	Value	
v	4.18E-01	m/d
Rc	1.07E+06	
u	3.92E-07	m/d

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.0025	-8.62E-02	9.17E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	8.76E-03
2	5	0.0025	-1.72E-01	8.42E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	7.09E-03
3	7.5	0.0025	-2.59E-01	7.72E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	5.80E-03
4	10	0.0025	-3.45E-01	7.08E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	4.84E-03
5	12.5	0.0025	-4.31E-01	6.50E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	4.09E-03
6	15	0.0025	-5.17E-01	5.96E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	3.49E-03
7	17.5	0.0025	-6.03E-01	5.47E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	3.01E-03
8	20	0.0025	-6.90E-01	5.02E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	2.61E-03
9	22.5	0.0025	-7.76E-01	4.60E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	2.27E-03
10	25	0.0025	-8.62E-01	4.22E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	1.99E-03
11	27.5	0.0025	-9.48E-01	3.87E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.75E-03
12	30	0.0025	-1.03E+00	3.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.54E-03
13	32.5	0.0025	-1.12E+00	3.26E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.36E-03
14	35	0.0025	-1.21E+00	2.99E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	1.20E-03
15	37.5	0.0025	-1.29E+00	2.74E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	1.07E-03
16	40	0.0025	-1.38E+00	2.52E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	9.47E-04
17	42.5	0.0025	-1.47E+00	2.31E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	8.42E-04
18	45	0.0025	-1.55E+00	2.12E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	7.49E-04
19	47.5	0.0025	-1.64E+00	1.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.67E-04
20	50	0.0025	-1.72E+00	1.78E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.95E-04



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

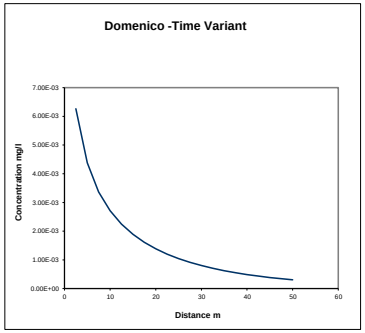
Contaminant **Aliphatic 12-16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.3	mg/l
Co	1.00E-02	mg/l
λ	1.58E-08	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.99E+04	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.00125	-8.62E-02	9.17E-01	-1.88E+46	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	6.26E-03
2	5	0.00125	-1.72E-01	8.42E-01	-1.88E+46	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	4.38E-03
3	7.5	0.00125	-2.59E-01	7.72E-01	-1.88E+46	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	3.37E-03
4	10	0.00125	-3.45E-01	7.08E-01	-1.88E+46	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	2.71E-03
5	12.5	0.00125	-4.31E-01	6.50E-01	-1.88E+46	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	2.24E-03
6	15	0.00125	-5.17E-01	5.96E-01	-1.88E+46	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.89E-03
7	17.5	0.00125	-6.03E-01	5.47E-01	-1.88E+46	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.61E-03
8	20	0.00125	-6.90E-01	5.02E-01	-1.88E+46	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	1.39E-03
9	22.5	0.00125	-7.76E-01	4.60E-01	-1.88E+46	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	1.20E-03
10	25	0.00125	-8.62E-01	4.22E-01	-1.88E+46	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.05E-03
11	27.5	0.00125	-9.48E-01	3.87E-01	-1.88E+46	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	9.14E-04
12	30	0.00125	-1.03E+00	3.55E-01	-1.88E+46	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	8.02E-04
13	32.5	0.00125	-1.12E+00	3.26E-01	-1.88E+46	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	7.06E-04
14	35	0.00125	-1.21E+00	2.99E-01	-1.88E+46	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	6.23E-04
15	37.5	0.00125	-1.29E+00	2.74E-01	-1.88E+46	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	5.51E-04
16	40	0.00125	-1.38E+00	2.52E-01	-1.88E+46	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	4.88E-04
17	42.5	0.00125	-1.47E+00	2.31E-01	-1.88E+46	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	4.33E-04
18	45	0.00125	-1.55E+00	2.12E-01	-1.88E+46	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	3.85E-04
19	47.5	0.00125	-1.64E+00	1.94E-01	-1.88E+46	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.42E-04
20	50	0.00125	-1.72E+00	1.78E-01	-1.88E+46	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.05E-04

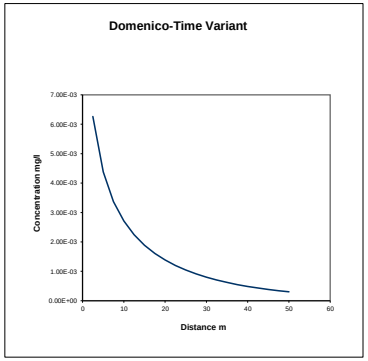


Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

Calc

Value		
v	4.18E-01	m/d
Rc	1.07E+06	
u	3.92E-07	m/d

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.00125	-8.62E-02	9.17E-01	-1.88E+46	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	8.76E-03
2	5	0.00125	-1.72E-01	8.42E-01	-1.88E+46	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	7.09E-03
3	7.5	0.00125	-2.59E-01	7.72E-01	-1.88E+46	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	5.80E-03
4	10	0.00125	-3.45E-01	7.08E-01	-1.88E+46	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	4.84E-03
5	12.5	0.00125	-4.31E-01	6.50E-01	-1.88E+46	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	4.09E-03
6	15	0.00125	-5.17E-01	5.96E-01	-1.88E+46	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	3.49E-03
7	17.5	0.00125	-6.03E-01	5.47E-01	-1.88E+46	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	3.01E-03
8	20	0.00125	-6.90E-01	5.02E-01	-1.88E+46	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	2.61E-03
9	22.5	0.00125	-7.76E-01	4.60E-01	-1.88E+46	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	2.27E-03
10	25	0.00125	-8.62E-01	4.22E-01	-1.88E+46	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	1.99E-03
11	27.5	0.00125	-9.48E-01	3.87E-01	-1.88E+46	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.75E-03
12	30	0.00125	-1.03E+00	3.55E-01	-1.88E+46	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.54E-03
13	32.5	0.00125	-1.12E+00	3.26E-01	-1.88E+46	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.36E-03
14	35	0.00125	-1.21E+00	2.99E-01	-1.88E+46	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	1.20E-03
15	37.5	0.00125	-1.29E+00	2.74E-01	-1.88E+46	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	1.07E-03
16	40	0.00125	-1.38E+00	2.52E-01	-1.88E+46	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	9.47E-04
17	42.5	0.00125	-1.47E+00	2.31E-01	-1.88E+46	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	8.42E-04
18	45	0.00125	-1.55E+00	2.12E-01	-1.88E+46	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	7.49E-04
19	47.5	0.00125	-1.64E+00	1.94E-01	-1.88E+46	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.67E-04
20	50	0.00125	-1.72E+00	1.78E-01	-1.88E+46	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.95E-04



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aromatic C5-C6			
Target Concentration (C_T)	0.01	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aromatic C5-C6**		
Target concentration	C_T	**0.01**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.16E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	1.35E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.25E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.39E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.01	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aromatic C5-C6**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.01** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**3.08E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.28E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aromatic C5-C6		from Level 1
Target Concentration	C_T	0.01	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		0.4	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	7.70E+01	days	R2174c-R10-App A
Calculated decay rate	λ	9.00E-03	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	9.00E-03	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.89E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.04E+00**	**fraction**
Calculated soil leachate concentration	Co	2.88E-01	mg/l

Remedial Targets

Level 3 Remedial Target	**6.29E-02**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	8.75E-02	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**4.89E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

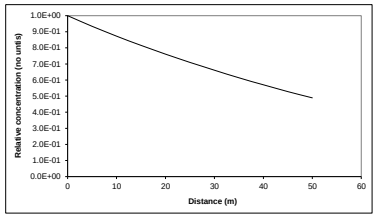
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	9.35E-02
2.5	9.67E-01	9.03E-02
5.0	9.34E-01	8.73E-02
7.5	9.03E-01	8.44E-02
10.0	8.73E-01	8.16E-02
12.5	8.44E-01	7.88E-02
15.0	8.15E-01	7.62E-02
17.5	7.88E-01	7.36E-02
20.0	7.61E-01	7.11E-02
22.5	7.35E-01	6.87E-02
25.0	7.10E-01	6.63E-02
27.5	6.85E-01	6.40E-02
30.0	6.61E-01	6.18E-02
32.5	6.37E-01	5.95E-02
35.0	6.14E-01	5.74E-02
37.5	5.92E-01	5.53E-02
40.0	5.70E-01	5.33E-02
42.5	5.49E-01	5.13E-02
45.0	5.28E-01	4.94E-02
47.5	5.09E-01	4.75E-02
50.0	4.89E-01	4.57E-02

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

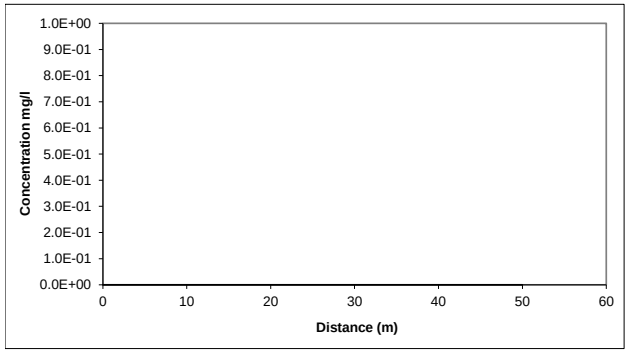
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.16E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.25E+00	l/kg
Factor (partitioning between soil and water)		1.39E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.04E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aromatic C5-C6		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	5.00E-01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	7.70E+01	days	R2174c-R10-App A
Calculated decay rate	λ	9.00E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.25E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable	
Groundwater flow velocity	v	4.18E-01 m/d
Retardation factor	Rf	2.78E+01 fraction
Decay rate used	λ	3.24E-04 d^{-1}
Rate of contaminant flow due to retardation	u	1.50E-02 m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	6.26E-02 mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**7.99E+00**

Remedial Targets

Remedial Target		**7.99E-02**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**6.26E-02**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	1.35E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.25E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

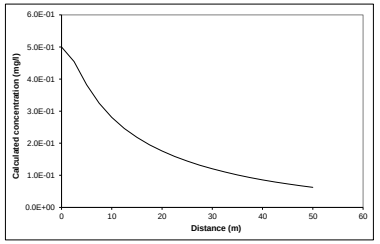
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	5.0E-01
2.5	4.54E-01
5.0	3.82E-01
7.5	3.24E-01
10.0	2.81E-01
12.5	2.46E-01
15.0	2.18E-01
17.5	1.95E-01
20.0	1.76E-01
22.5	1.59E-01
25.0	1.44E-01
27.5	1.32E-01
30.0	1.20E-01
32.5	1.10E-01
35.0	1.01E-01
37.5	9.32E-02
40.0	8.59E-02
42.5	7.92E-02
45.0	7.31E-02
47.5	6.76E-02
50.0	6.26E-02

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aromatic C5-C6**

Parameter	Value	Units
(carried over from input sheet)		
C_T	1.00E-02	mg/l
Kd	1.25E+00	l/kg
foc	9.30E-03	fraction
koc	1.35E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.16E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			1.25E+00	l/kg

Calculated Remedial Target	**1.39E-02**	**mg/kg**	**for**	**Aromatic C5-C6**

Factor (partitioning between soil and water) 1.39E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aromatic C5-C6**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	1.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

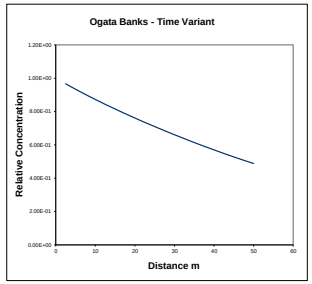
Contaminant **Aromatic C5-C6**

OGATA BANKS SOLUTION

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.000E-02	mg/l
DF	3.077E+00	
λ	9.002E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-3.40E-02	9.67E-01	-6.32E+48	2	5.34E-01	1.71E+00	6.32E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.67E-01
2	5	0.13	-6.80E-02	9.34E-01	-6.32E+48	2	1.07E+00	2.91E+00	6.32E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.34E-01
3	7.5	0.13	-1.02E-01	9.03E-01	-6.32E+48	2	1.60E+00	4.96E+00	6.32E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.03E-01
4	10	0.13	-1.36E-01	8.73E-01	-6.32E+48	2	2.14E+00	8.47E+00	6.32E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.73E-01
5	12.5	0.13	-1.70E-01	8.44E-01	-6.32E+48	2	2.67E+00	1.44E+01	6.32E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	8.44E-01
6	15	0.13	-2.04E-01	8.15E-01	-6.32E+48	2	3.20E+00	2.46E+01	6.32E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	8.15E-01
7	17.5	0.13	-2.38E-01	7.88E-01	-6.32E+48	2	3.74E+00	4.20E+01	6.32E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	7.88E-01
8	20	0.13	-2.72E-01	7.62E-01	-6.32E+48	2	4.27E+00	7.17E+01	6.32E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	7.61E-01
9	22.5	0.13	-3.06E-01	7.36E-01	-6.32E+48	2	4.81E+00	1.22E+02	6.32E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	7.35E-01
10	25	0.13	-3.40E-01	7.12E-01	-6.32E+48	2	5.34E+00	2.09E+02	6.32E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	7.10E-01
11	27.5	0.13	-3.74E-01	6.88E-01	-6.32E+48	2	5.87E+00	3.56E+02	6.32E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	6.85E-01
12	30	0.13	-4.08E-01	6.65E-01	-6.32E+48	2	6.41E+00	6.07E+02	6.32E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	6.61E-01
13	32.5	0.13	-4.42E-01	6.43E-01	-6.32E+48	2	6.94E+00	1.04E+03	6.32E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	6.37E-01
14	35	0.13	-4.76E-01	6.21E-01	-6.32E+48	2	7.48E+00	1.77E+03	6.32E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	6.14E-01
15	37.5	0.13	-5.10E-01	6.00E-01	-6.32E+48	2	8.01E+00	3.01E+03	6.32E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	5.92E-01
16	40	0.13	-5.44E-01	5.80E-01	-6.32E+48	2	8.54E+00	5.14E+03	6.32E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	5.70E-01
17	42.5	0.13	-5.78E-01	5.61E-01	-6.32E+48	2	9.08E+00	8.76E+03	6.32E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	5.49E-01
18	45	0.13	-6.12E-01	5.42E-01	-6.32E+48	2	9.61E+00	1.49E+04	6.32E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	5.28E-01
19	47.5	0.13	-6.46E-01	5.24E-01	-6.32E+48	2	1.01E+01	2.55E+04	6.32E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.08E-01
20	50	0.13	-6.80E-01	5.06E-01	-6.32E+48	2	1.07E+01	4.35E+04	6.32E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.88E-01

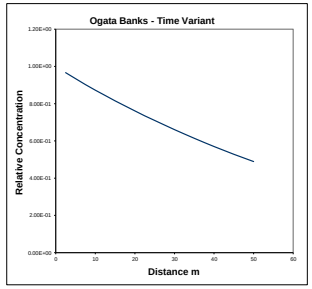


Calc **Value**

v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-3.40E-02	9.67E-01	-6.32E+48	2	5.34E-01	1.71E+00	6.32E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.13	-6.80E-02	9.34E-01	-6.32E+48	2	1.07E+00	2.91E+00	6.32E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.13	-1.02E-01	9.03E-01	-6.32E+48	2	1.60E+00	4.96E+00	6.32E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.13	-1.36E-01	8.73E-01	-6.32E+48	2	2.14E+00	8.47E+00	6.32E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.13	-1.70E-01	8.44E-01	-6.32E+48	2	2.67E+00	1.44E+01	6.32E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.13	-2.04E-01	8.15E-01	-6.32E+48	2	3.20E+00	2.46E+01	6.32E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.13	-2.38E-01	7.88E-01	-6.32E+48	2	3.74E+00	4.20E+01	6.32E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.13	-2.72E-01	7.62E-01	-6.32E+48	2	4.27E+00	7.17E+01	6.32E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.13	-3.06E-01	7.36E-01	-6.32E+48	2	4.81E+00	1.22E+02	6.32E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.13	-3.40E-01	7.12E-01	-6.32E+48	2	5.34E+00	2.09E+02	6.32E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.13	-3.74E-01	6.88E-01	-6.32E+48	2	5.87E+00	3.56E+02	6.32E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.13	-4.08E-01	6.65E-01	-6.32E+48	2	6.41E+00	6.07E+02	6.32E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.13	-4.42E-01	6.43E-01	-6.32E+48	2	6.94E+00	1.04E+03	6.32E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.13	-4.76E-01	6.21E-01	-6.32E+48	2	7.48E+00	1.77E+03	6.32E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.13	-5.10E-01	6.00E-01	-6.32E+48	2	8.01E+00	3.01E+03	6.32E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.13	-5.44E-01	5.80E-01	-6.32E+48	2	8.54E+00	5.14E+03	6.32E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.13	-5.78E-01	5.61E-01	-6.32E+48	2	9.08E+00	8.76E+03	6.32E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.13	-6.12E-01	5.42E-01	-6.32E+48	2	9.61E+00	1.49E+04	6.32E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.13	-6.46E-01	5.24E-01	-6.32E+48	2	1.01E+01	2.55E+04	6.32E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.13	-6.80E-01	5.06E-01	-6.32E+48	2	1.07E+01	4.35E+04	6.32E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.89E-01



Date:	13.07.2021
Version:	1

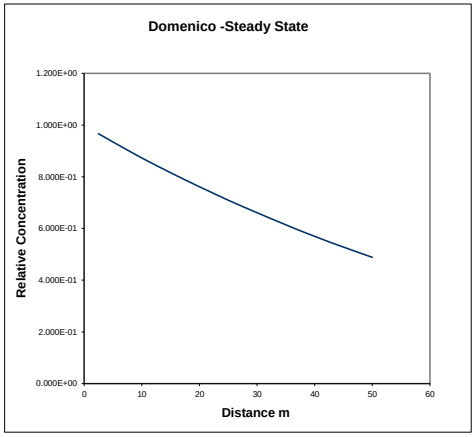
Contaminant **ıromatic C5-C6**

Input	Value	Units
C_T	1.000E-02	mg/l
DF	3.077E+00	
λ	9.002E-03	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-3.40E-02	9.67E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.666E-01
2	5	0.25	-6.80E-02	9.34E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.342E-01
3	7.5	0.25	-1.02E-01	9.03E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.030E-01
4	10	0.25	-1.36E-01	8.73E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.728E-01
5	12.5	0.25	-1.70E-01	8.44E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	8.436E-01
6	15	0.25	-2.04E-01	8.15E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	8.153E-01
7	17.5	0.25	-2.38E-01	7.88E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	7.879E-01
8	20	0.25	-2.72E-01	7.62E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	7.612E-01
9	22.5	0.25	-3.06E-01	7.36E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	7.351E-01
10	25	0.25	-3.40E-01	7.12E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	7.097E-01
11	27.5	0.25	-3.74E-01	6.88E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	6.849E-01
12	30	0.25	-4.08E-01	6.65E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	6.607E-01
13	32.5	0.25	-4.42E-01	6.43E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	6.371E-01
14	35	0.25	-4.76E-01	6.21E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	6.140E-01
15	37.5	0.25	-5.10E-01	6.00E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	5.916E-01
16	40	0.25	-5.44E-01	5.80E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	5.697E-01
17	42.5	0.25	-5.78E-01	5.61E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	5.485E-01
18	45	0.25	-6.12E-01	5.42E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	5.279E-01
19	47.5	0.25	-6.46E-01	5.24E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.079E-01
20	50	0.25	-6.80E-01	5.06E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.884E-01

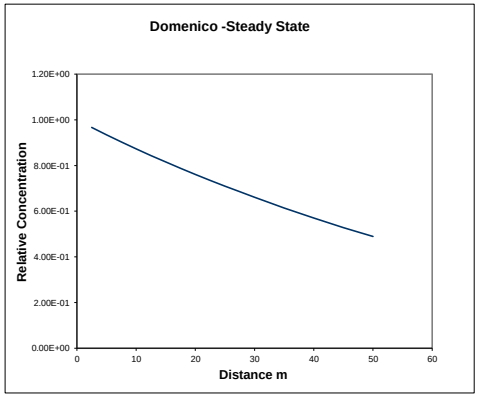


Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-3.40E-02	9.67E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.25	-6.80E-02	9.34E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.25	-1.02E-01	9.03E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.25	-1.36E-01	8.73E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.25	-1.70E-01	8.44E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.25	-2.04E-01	8.15E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.25	-2.38E-01	7.88E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.25	-2.72E-01	7.62E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.25	-3.06E-01	7.36E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.25	-3.40E-01	7.12E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.25	-3.74E-01	6.88E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.25	-4.08E-01	6.65E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.25	-4.42E-01	6.43E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.25	-4.76E-01	6.21E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.25	-5.10E-01	6.00E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.25	-5.44E-01	5.80E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.25	-5.78E-01	5.61E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.25	-6.12E-01	5.42E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.25	-6.46E-01	5.24E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.25	-6.80E-01	5.06E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.89E-01



Date:	13.07.2021
Version:	1

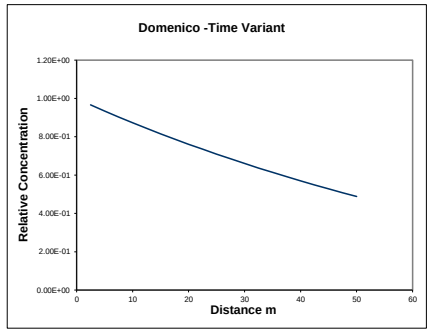
DOMENICO (TIME VARIANT)

Contaminant **\romatic C5-C6**

Input	Value	Units
C_T	0.01	mg/l
DF	3.0774	
λ	9.002E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

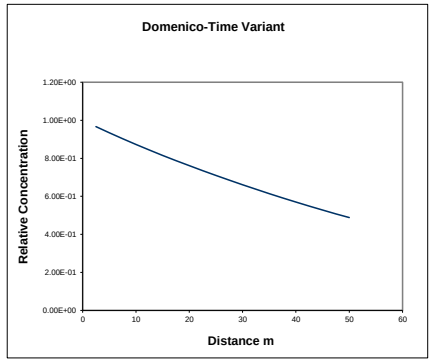
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-3.40E-02	9.67E-01	-6.32E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.67E-01
2	5	0.125	-6.80E-02	9.34E-01	-6.32E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.34E-01
3	7.5	0.125	-1.02E-01	9.03E-01	-6.32E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.03E-01
4	10	0.125	-1.36E-01	8.73E-01	-6.32E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.73E-01
5	12.5	0.125	-1.70E-01	8.44E-01	-6.32E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	8.44E-01
6	15	0.125	-2.04E-01	8.15E-01	-6.32E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	8.15E-01
7	17.5	0.125	-2.38E-01	7.88E-01	-6.32E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	7.88E-01
8	20	0.125	-2.72E-01	7.62E-01	-6.32E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	7.61E-01
9	22.5	0.125	-3.06E-01	7.36E-01	-6.32E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	7.35E-01
10	25	0.125	-3.40E-01	7.12E-01	-6.32E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	7.10E-01
11	27.5	0.125	-3.74E-01	6.88E-01	-6.32E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	6.85E-01
12	30	0.125	-4.08E-01	6.65E-01	-6.32E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	6.61E-01
13	32.5	0.125	-4.42E-01	6.43E-01	-6.32E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	6.37E-01
14	35	0.125	-4.76E-01	6.21E-01	-6.32E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	6.14E-01
15	37.5	0.125	-5.10E-01	6.00E-01	-6.32E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	5.92E-01
16	40	0.125	-5.44E-01	5.80E-01	-6.32E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	5.70E-01
17	42.5	0.125	-5.78E-01	5.61E-01	-6.32E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	5.49E-01
18	45	0.125	-6.12E-01	5.42E-01	-6.32E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	5.28E-01
19	47.5	0.125	-6.46E-01	5.24E-01	-6.32E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.08E-01
20	50	0.125	-6.80E-01	5.06E-01	-6.32E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.88E-01



Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-3.40E-02	9.67E-01	-6.32E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.125	-6.80E-02	9.34E-01	-6.32E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.125	-1.02E-01	9.03E-01	-6.32E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.125	-1.36E-01	8.73E-01	-6.32E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.125	-1.70E-01	8.44E-01	-6.32E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.125	-2.04E-01	8.15E-01	-6.32E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.125	-2.38E-01	7.88E-01	-6.32E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.125	-2.72E-01	7.62E-01	-6.32E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.125	-3.06E-01	7.36E-01	-6.32E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.125	-3.40E-01	7.12E-01	-6.32E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.125	-3.74E-01	6.88E-01	-6.32E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.125	-4.08E-01	6.65E-01	-6.32E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.125	-4.42E-01	6.43E-01	-6.32E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.125	-4.76E-01	6.21E-01	-6.32E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.125	-5.10E-01	6.00E-01	-6.32E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.125	-5.44E-01	5.80E-01	-6.32E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.125	-5.78E-01	5.61E-01	-6.32E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.125	-6.12E-01	5.42E-01	-6.32E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.125	-6.46E-01	5.24E-01	-6.32E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.125	-6.80E-01	5.06E-01	-6.32E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.89E-01



Date:	13.07.2021
Version:	1

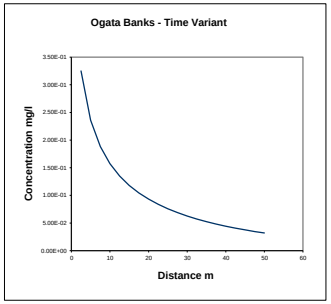
OGATA BANKS SOLUTION

Contaminant	Aromatic C5-C6	
Input	**Value**	**Units**
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

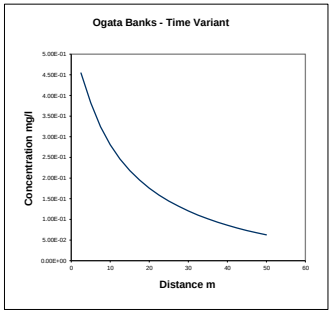
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.0625	-4.9E-02	9.5E-01	-3.3E+48	2.000	5.5E-01	1.7E+00	3.3E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	3.25E-01
2	5	0.0625	-9.8E-02	9.1E-01	-3.3E+48	2.000	1.1E+00	3.0E+00	3.3E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	2.36E-01
3	7.5	0.0625	-1.5E-01	8.6E-01	-3.3E+48	2.000	1.6E+00	5.2E+00	3.3E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.88E-01
4	10	0.0625	-2.0E-01	8.2E-01	-3.3E+48	2.000	2.2E+00	9.0E+00	3.3E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.57E-01
5	12.5	0.0625	-2.5E-01	7.8E-01	-3.3E+48	2.000	2.7E+00	1.6E+01	3.3E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.35E-01
6	15	0.0625	-2.9E-01	7.5E-01	-3.3E+48	2.000	3.3E+00	2.7E+01	3.3E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.18E-01
7	17.5	0.0625	-3.4E-01	7.1E-01	-3.3E+48	2.000	3.8E+00	4.7E+01	3.3E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.04E-01
8	20	0.0625	-3.9E-01	6.8E-01	-3.3E+48	2.000	4.4E+00	8.1E+01	3.3E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	9.33E-02
9	22.5	0.0625	-4.4E-01	6.4E-01	-3.3E+48	2.000	4.9E+00	1.4E+02	3.3E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	8.39E-02
10	25	0.0625	-4.9E-01	6.1E-01	-3.3E+48	2.000	5.5E+00	2.4E+02	3.3E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	7.58E-02
11	27.5	0.0625	-5.4E-01	5.8E-01	-3.3E+48	2.000	6.0E+00	4.2E+02	3.3E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	6.88E-02
12	30	0.0625	-5.9E-01	5.6E-01	-3.3E+48	2.000	6.6E+00	7.3E+02	3.3E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	6.27E-02
13	32.5	0.0625	-6.4E-01	5.3E-01	-3.3E+48	2.000	7.1E+00	1.3E+03	3.3E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	5.73E-02
14	35	0.0625	-6.9E-01	5.0E-01	-3.3E+48	2.000	7.7E+00	2.2E+03	3.3E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	5.25E-02
15	37.5	0.0625	-7.4E-01	4.8E-01	-3.3E+48	2.000	8.2E+00	3.8E+03	3.3E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	4.81E-02
16	40	0.0625	-7.8E-01	4.6E-01	-3.3E+48	2.000	8.8E+00	6.5E+03	3.3E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	4.43E-02
17	42.5	0.0625	-8.3E-01	4.3E-01	-3.3E+48	2.000	9.3E+00	1.1E+04	3.3E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	4.08E-02
18	45	0.0625	-8.8E-01	4.1E-01	-3.3E+48	2.000	9.9E+00	2.0E+04	3.3E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	3.76E-02
19	47.5	0.0625	-9.3E-01	3.9E-01	-3.3E+48	2.000	1.0E+01	3.4E+04	3.3E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.47E-02
20	50	0.0625	-9.8E-01	3.8E-01	-3.3E+48	2.000	1.1E+01	5.9E+04	3.3E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.21E-02



Calc	Value	
v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.0625	-4.9E-02	9.5E-01	-3.3E+48	2.000	5.5E-01	1.7E+00	3.3E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	4.54E-01
2	5	0.0625	-9.8E-02	9.1E-01	-3.3E+48	2.000	1.1E+00	3.0E+00	3.3E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	3.82E-01
3	7.5	0.0625	-1.5E-01	8.6E-01	-3.3E+48	2.000	1.6E+00	5.2E+00	3.3E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	3.24E-01
4	10	0.0625	-2.0E-01	8.2E-01	-3.3E+48	2.000	2.2E+00	9.0E+00	3.3E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.81E-01
5	12.5	0.0625	-2.5E-01	7.8E-01	-3.3E+48	2.000	2.7E+00	1.6E+01	3.3E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.46E-01
6	15	0.0625	-2.9E-01	7.5E-01	-3.3E+48	2.000	3.3E+00	2.7E+01	3.3E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.18E-01
7	17.5	0.0625	-3.4E-01	7.1E-01	-3.3E+48	2.000	3.8E+00	4.7E+01	3.3E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.95E-01
8	20	0.0625	-3.9E-01	6.8E-01	-3.3E+48	2.000	4.4E+00	8.1E+01	3.3E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.76E-01
9	22.5	0.0625	-4.4E-01	6.4E-01	-3.3E+48	2.000	4.9E+00	1.4E+02	3.3E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.59E-01
10	25	0.0625	-4.9E-01	6.1E-01	-3.3E+48	2.000	5.5E+00	2.4E+02	3.3E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	1.44E-01
11	27.5	0.0625	-5.4E-01	5.8E-01	-3.3E+48	2.000	6.0E+00	4.2E+02	3.3E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.32E-01
12	30	0.0625	-5.9E-01	5.6E-01	-3.3E+48	2.000	6.6E+00	7.3E+02	3.3E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.20E-01
13	32.5	0.0625	-6.4E-01	5.3E-01	-3.3E+48	2.000	7.1E+00	1.3E+03	3.3E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.10E-01
14	35	0.0625	-6.9E-01	5.0E-01	-3.3E+48	2.000	7.7E+00	2.2E+03	3.3E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	1.01E-01
15	37.5	0.0625	-7.4E-01	4.8E-01	-3.3E+48	2.000	8.2E+00	3.8E+03	3.3E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	9.32E-02
16	40	0.0625	-7.8E-01	4.6E-01	-3.3E+48	2.000	8.8E+00	6.5E+03	3.3E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	8.59E-02
17	42.5	0.0625	-8.3E-01	4.3E-01	-3.3E+48	2.000	9.3E+00	1.1E+04	3.3E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	7.92E-02
18	45	0.0625	-8.8E-01	4.1E-01	-3.3E+48	2.000	9.9E+00	2.0E+04	3.3E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	7.31E-02
19	47.5	0.0625	-9.3E-01	3.9E-01	-3.3E+48	2.000	1.0E+01	3.4E+04	3.3E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.76E-02
20	50	0.0625	-9.8E-01	3.8E-01	-3.3E+48	2.000	1.1E+01	5.9E+04	3.3E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	6.26E-02



Date:	13.07.2021
Version:	1

Contaminant **ıromatic C5-C6**

Input	Value	Units
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

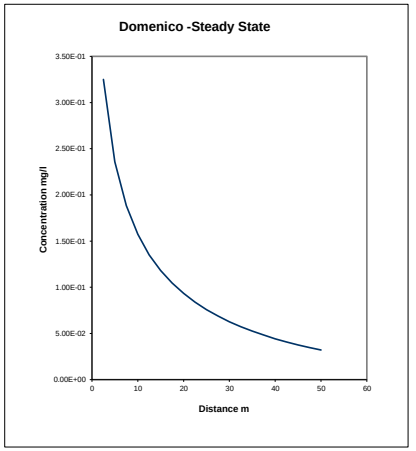
Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

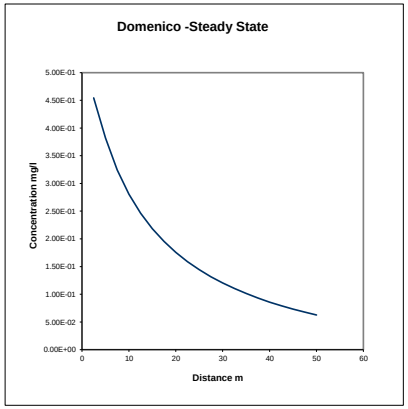
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.125	-4.90E-02	9.52E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	3.25E-01
2	5	0.125	-9.80E-02	9.07E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	2.36E-01
3	7.5	0.125	-1.47E-01	8.63E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.88E-01
4	10	0.125	-1.96E-01	8.22E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.57E-01
5	12.5	0.125	-2.45E-01	7.83E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.35E-01
6	15	0.125	-2.94E-01	7.45E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.18E-01
7	17.5	0.125	-3.43E-01	7.10E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.04E-01
8	20	0.125	-3.92E-01	6.76E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	9.33E-02
9	22.5	0.125	-4.41E-01	6.43E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	8.39E-02
10	25	0.125	-4.90E-01	6.13E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	7.58E-02
11	27.5	0.125	-5.39E-01	5.83E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	6.88E-02
12	30	0.125	-5.88E-01	5.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	6.27E-02
13	32.5	0.125	-6.37E-01	5.29E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	5.73E-02
14	35	0.125	-6.86E-01	5.03E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	5.25E-02
15	37.5	0.125	-7.35E-01	4.79E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	4.81E-02
16	40	0.125	-7.84E-01	4.56E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	4.43E-02
17	42.5	0.125	-8.33E-01	4.35E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	4.08E-02
18	45	0.125	-8.82E-01	4.14E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	3.76E-02
19	47.5	0.125	-9.31E-01	3.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.47E-02
20	50	0.125	-9.80E-01	3.75E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.21E-02



DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.125	-4.90E-02	9.52E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	4.54E-01
2	5	0.125	-9.80E-02	9.07E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	3.82E-01
3	7.5	0.125	-1.47E-01	8.63E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	3.24E-01
4	10	0.125	-1.96E-01	8.22E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.81E-01
5	12.5	0.125	-2.45E-01	7.83E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.46E-01
6	15	0.125	-2.94E-01	7.45E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.18E-01
7	17.5	0.125	-3.43E-01	7.10E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.95E-01
8	20	0.125	-3.92E-01	6.76E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.76E-01
9	22.5	0.125	-4.41E-01	6.43E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.59E-01
10	25	0.125	-4.90E-01	6.13E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	1.44E-01
11	27.5	0.125	-5.39E-01	5.83E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.32E-01
12	30	0.125	-5.88E-01	5.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.20E-01
13	32.5	0.125	-6.37E-01	5.29E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.10E-01
14	35	0.125	-6.86E-01	5.03E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	1.01E-01
15	37.5	0.125	-7.35E-01	4.79E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	9.32E-02
16	40	0.125	-7.84E-01	4.56E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	8.59E-02
17	42.5	0.125	-8.33E-01	4.35E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	7.92E-02
18	45	0.125	-8.82E-01	4.14E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	7.31E-02
19	47.5	0.125	-9.31E-01	3.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.76E-02
20	50	0.125	-9.80E-01	3.75E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	6.26E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

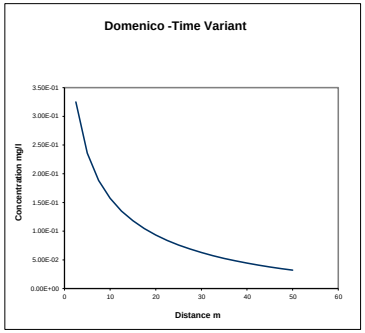
Contaminant **Aromatic C5-C6**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.0625	-4.90E-02	9.52E-01	-3.28E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	3.25E-01
2	5	0.0625	-9.80E-02	9.07E-01	-3.28E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	2.36E-01
3	7.5	0.0625	-1.47E-01	8.63E-01	-3.28E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.88E-01
4	10	0.0625	-1.96E-01	8.22E-01	-3.28E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.57E-01
5	12.5	0.0625	-2.45E-01	7.83E-01	-3.28E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.35E-01
6	15	0.0625	-2.94E-01	7.45E-01	-3.28E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.18E-01
7	17.5	0.0625	-3.43E-01	7.10E-01	-3.28E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.04E-01
8	20	0.0625	-3.92E-01	6.76E-01	-3.28E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	9.33E-02
9	22.5	0.0625	-4.41E-01	6.43E-01	-3.28E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	8.39E-02
10	25	0.0625	-4.90E-01	6.13E-01	-3.28E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	7.58E-02
11	27.5	0.0625	-5.39E-01	5.83E-01	-3.28E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	6.88E-02
12	30	0.0625	-5.88E-01	5.55E-01	-3.28E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	6.27E-02
13	32.5	0.0625	-6.37E-01	5.29E-01	-3.28E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	5.73E-02
14	35	0.0625	-6.86E-01	5.03E-01	-3.28E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	5.25E-02
15	37.5	0.0625	-7.35E-01	4.79E-01	-3.28E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	4.81E-02
16	40	0.0625	-7.84E-01	4.56E-01	-3.28E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	4.43E-02
17	42.5	0.0625	-8.33E-01	4.35E-01	-3.28E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	4.08E-02
18	45	0.0625	-8.82E-01	4.14E-01	-3.28E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	3.76E-02
19	47.5	0.0625	-9.31E-01	3.94E-01	-3.28E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.47E-02
20	50	0.0625	-9.80E-01	3.75E-01	-3.28E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.21E-02

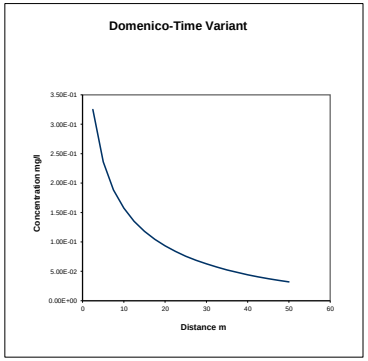


Calc **Value**

v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.0625	-4.90E-02	9.52E-01	-3.28E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	4.54E-01
2	5	0.0625	-9.80E-02	9.07E-01	-3.28E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	3.82E-01
3	7.5	0.0625	-1.47E-01	8.63E-01	-3.28E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	3.24E-01
4	10	0.0625	-1.96E-01	8.22E-01	-3.28E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.81E-01
5	12.5	0.0625	-2.45E-01	7.83E-01	-3.28E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.46E-01
6	15	0.0625	-2.94E-01	7.45E-01	-3.28E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.18E-01
7	17.5	0.0625	-3.43E-01	7.10E-01	-3.28E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.95E-01
8	20	0.0625	-3.92E-01	6.76E-01	-3.28E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.76E-01
9	22.5	0.0625	-4.41E-01	6.43E-01	-3.28E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.59E-01
10	25	0.0625	-4.90E-01	6.13E-01	-3.28E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	1.44E-01
11	27.5	0.0625	-5.39E-01	5.83E-01	-3.28E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.32E-01
12	30	0.0625	-5.88E-01	5.55E-01	-3.28E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.20E-01
13	32.5	0.0625	-6.37E-01	5.29E-01	-3.28E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.10E-01
14	35	0.0625	-6.86E-01	5.03E-01	-3.28E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	1.01E-01
15	37.5	0.0625	-7.35E-01	4.79E-01	-3.28E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	9.32E-02
16	40	0.0625	-7.84E-01	4.56E-01	-3.28E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	8.59E-02
17	42.5	0.0625	-8.33E-01	4.35E-01	-3.28E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	7.92E-02
18	45	0.0625	-8.82E-01	4.14E-01	-3.28E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	7.31E-02
19	47.5	0.0625	-9.31E-01	3.94E-01	-3.28E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.76E-02
20	50	0.0625	-9.80E-01	3.75E-01	-3.28E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	6.26E-02



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aromatic C6-C8			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aromatic C6-C8**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aromatic C6-C8**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aromatic C6-C8		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.39E-03	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	1.49E-02	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.03E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**3.30E+01**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**7.52E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.53E+01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**3.03E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

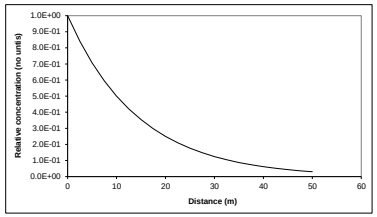
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	8.41E-01	7.24E+00
5.0	7.07E-01	6.09E+00
7.5	5.95E-01	5.12E+00
10.0	5.00E-01	4.31E+00
12.5	4.21E-01	3.62E+00
15.0	3.54E-01	3.05E+00
17.5	2.97E-01	2.56E+00
20.0	2.50E-01	2.15E+00
22.5	2.10E-01	1.81E+00
25.0	1.77E-01	1.52E+00
27.5	1.48E-01	1.28E+00
30.0	1.24E-01	1.07E+00
32.5	1.04E-01	8.99E-01
35.0	8.76E-02	7.54E-01
37.5	7.34E-02	6.32E-01
40.0	6.15E-02	5.30E-01
42.5	5.16E-02	4.44E-01
45.0	4.32E-02	3.72E-01
47.5	3.62E-02	3.11E-01
50.0	3.03E-02	2.61E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

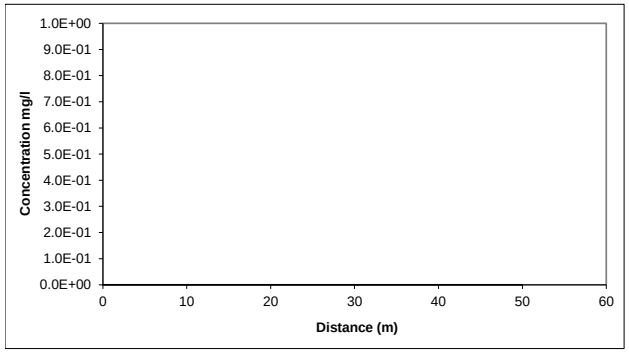
Water filled soil porosity	θ_W	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	3.30E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aromatic C6-C8		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

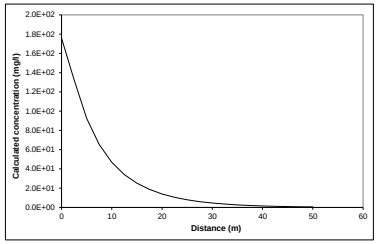
Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.39E-03	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.34E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**3.29E+02**	

Remedial Targets

Remedial Target		**2.44E+01**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**5.34E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.33E+02
5.0	9.26E+01
7.5	6.53E+01
10.0	4.69E+01
12.5	3.42E+01
15.0	2.51E+01
17.5	1.87E+01
20.0	1.40E+01
22.5	1.05E+01
25.0	7.91E+00
27.5	5.99E+00
30.0	4.55E+00
32.5	3.46E+00
35.0	2.64E+00
37.5	2.01E+00
40.0	1.54E+00
42.5	1.18E+00
45.0	9.05E-01
47.5	6.95E-01
50.0	5.34E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aromatic C6-C8**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			1.90E+00	l/kg

Calculated Remedial Target	**1.51E-01**	**mg/kg**	**for**	**Aromatic C6-C8**

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aromatic C6-C8**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

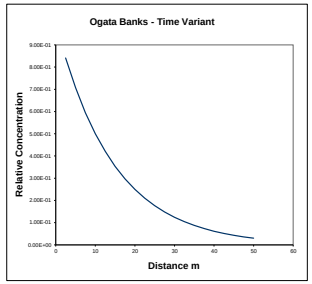
Contaminant **Aromatic C6-C8**

OGATA BANKS SOLUTION

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	1.391E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	1.897E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-1.46E+48	2	6.73E-01	1.96E+00	1.46E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-1.46E+48	2	1.35E+00	3.84E+00	1.46E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-1.46E+48	2	2.02E+00	7.53E+00	1.46E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-1.46E+48	2	2.69E+00	1.48E+01	1.46E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-1.46E+48	2	3.37E+00	2.90E+01	1.46E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-1.46E+48	2	4.04E+00	5.68E+01	1.46E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-1.46E+48	2	4.71E+00	1.11E+02	1.46E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-1.46E+48	2	5.39E+00	2.18E+02	1.46E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-1.46E+48	2	6.06E+00	4.28E+02	1.46E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-1.46E+48	2	6.73E+00	8.38E+02	1.46E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-1.46E+48	2	7.40E+00	1.64E+03	1.46E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-1.46E+48	2	8.08E+00	3.22E+03	1.46E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-1.46E+48	2	8.75E+00	6.32E+03	1.46E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-1.46E+48	2	9.42E+00	1.24E+04	1.46E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-1.46E+48	2	1.01E+01	2.43E+04	1.46E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-1.46E+48	2	1.08E+01	4.76E+04	1.46E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-1.46E+48	2	1.14E+01	9.33E+04	1.46E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	5.15E-02
18	45	0.13	-3.12E+00	4.43E-02	-1.46E+48	2	1.21E+01	1.83E+05	1.46E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	4.31E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-1.46E+48	2	1.28E+01	3.59E+05	1.46E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	3.61E-02
20	50	0.13	-3.46E+00	3.13E-02	-1.46E+48	2	1.35E+01	7.03E+05	1.46E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	3.02E-02

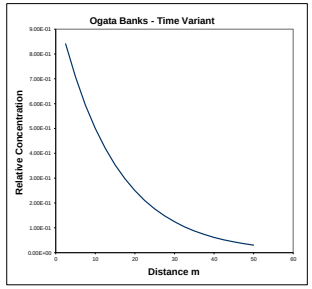


Calc **Value**

v	0.6195	m/d
Rc	41.5311	
u	0.0149	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-1.46E+48	2	6.73E-01	1.96E+00	1.46E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-1.46E+48	2	1.35E+00	3.84E+00	1.46E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-1.46E+48	2	2.02E+00	7.53E+00	1.46E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-1.46E+48	2	2.69E+00	1.48E+01	1.46E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-1.46E+48	2	3.37E+00	2.90E+01	1.46E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-1.46E+48	2	4.04E+00	5.68E+01	1.46E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-1.46E+48	2	4.71E+00	1.11E+02	1.46E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-1.46E+48	2	5.39E+00	2.18E+02	1.46E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-1.46E+48	2	6.06E+00	4.28E+02	1.46E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-1.46E+48	2	6.73E+00	8.38E+02	1.46E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-1.46E+48	2	7.40E+00	1.64E+03	1.46E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-1.46E+48	2	8.08E+00	3.22E+03	1.46E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-1.46E+48	2	8.75E+00	6.32E+03	1.46E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-1.46E+48	2	9.42E+00	1.24E+04	1.46E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-1.46E+48	2	1.01E+01	2.43E+04	1.46E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-1.46E+48	2	1.08E+01	4.76E+04	1.46E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-1.46E+48	2	1.14E+01	9.33E+04	1.46E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.13	-3.12E+00	4.43E-02	-1.46E+48	2	1.21E+01	1.83E+05	1.46E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-1.46E+48	2	1.28E+01	3.59E+05	1.46E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.13	-3.46E+00	3.13E-02	-1.46E+48	2	1.35E+01	7.03E+05	1.46E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	3.03E-02



Date:	13.07.2021
Version:	1

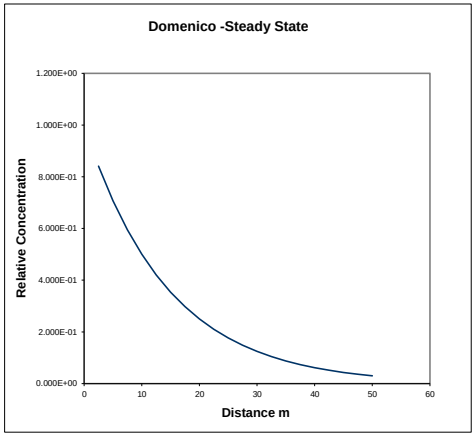
Contaminant **ıromatic C6-C8**

Input	Value	Units
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	1.391E-03	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	1.897E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.410E-01
2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.073E-01
3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.949E-01
4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.003E-01
5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.207E-01
6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.538E-01
7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	2.975E-01
8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.501E-01
9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.102E-01
10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	1.765E-01
11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.482E-01
12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.244E-01
13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.044E-01
14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	8.755E-02
15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	7.339E-02
16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	6.150E-02
17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	5.152E-02
18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	4.314E-02
19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	3.611E-02
20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	3.022E-02

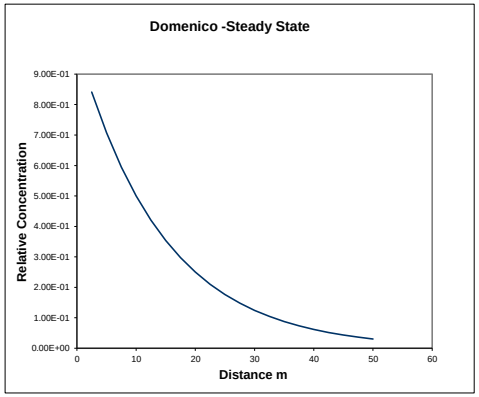


Calc	Value	
v	6.19E-01	m/d
Rc	4.15E+01	
u	1.49E-02	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	3.03E-02



Date:	13.07.2021
Version:	1

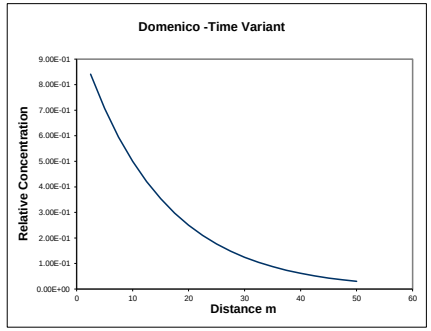
DOMENICO (TIME VARIANT)

Contaminant **\romatic C6-C8**

Input	Value	Units
C_T	0.074	mg/l
DF	3.0774	
λ	1.391E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	1.897E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

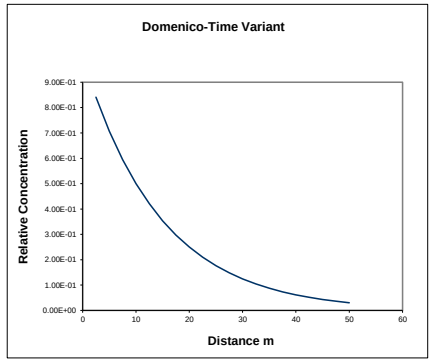
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.73E-01	8.41E-01	-1.46E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
2	5	0.125	-3.46E-01	7.07E-01	-1.46E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
3	7.5	0.125	-5.19E-01	5.95E-01	-1.46E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
4	10	0.125	-6.93E-01	5.00E-01	-1.46E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
5	12.5	0.125	-8.66E-01	4.21E-01	-1.46E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.21E-01
6	15	0.125	-1.04E+00	3.54E-01	-1.46E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.54E-01
7	17.5	0.125	-1.21E+00	2.98E-01	-1.46E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	2.97E-01
8	20	0.125	-1.39E+00	2.50E-01	-1.46E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.50E-01
9	22.5	0.125	-1.56E+00	2.10E-01	-1.46E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.10E-01
10	25	0.125	-1.73E+00	1.77E-01	-1.46E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	1.77E-01
11	27.5	0.125	-1.90E+00	1.49E-01	-1.46E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.48E-01
12	30	0.125	-2.08E+00	1.25E-01	-1.46E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.24E-01
13	32.5	0.125	-2.25E+00	1.05E-01	-1.46E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.04E-01
14	35	0.125	-2.42E+00	8.86E-02	-1.46E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	8.76E-02
15	37.5	0.125	-2.60E+00	7.45E-02	-1.46E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	7.34E-02
16	40	0.125	-2.77E+00	6.26E-02	-1.46E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	6.15E-02
17	42.5	0.125	-2.94E+00	5.27E-02	-1.46E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	5.15E-02
18	45	0.125	-3.12E+00	4.43E-02	-1.46E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	4.31E-02
19	47.5	0.125	-3.29E+00	3.73E-02	-1.46E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	3.61E-02
20	50	0.125	-3.46E+00	3.13E-02	-1.46E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	3.02E-02



Calc	Value	
v	6.19E-01	m/d
Rc	4.15E+01	
u	1.49E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.73E-01	8.41E-01	-1.46E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.125	-3.46E-01	7.07E-01	-1.46E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.125	-5.19E-01	5.95E-01	-1.46E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.125	-6.93E-01	5.00E-01	-1.46E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.125	-8.66E-01	4.21E-01	-1.46E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.125	-1.04E+00	3.54E-01	-1.46E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.125	-1.21E+00	2.98E-01	-1.46E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.125	-1.39E+00	2.50E-01	-1.46E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.125	-1.56E+00	2.10E-01	-1.46E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.125	-1.73E+00	1.77E-01	-1.46E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.125	-1.90E+00	1.49E-01	-1.46E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.125	-2.08E+00	1.25E-01	-1.46E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.125	-2.25E+00	1.05E-01	-1.46E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.125	-2.42E+00	8.86E-02	-1.46E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.125	-2.60E+00	7.45E-02	-1.46E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.125	-2.77E+00	6.26E-02	-1.46E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.125	-2.94E+00	5.27E-02	-1.46E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.125	-3.12E+00	4.43E-02	-1.46E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.125	-3.29E+00	3.73E-02	-1.46E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.125	-3.46E+00	3.13E-02	-1.46E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	3.03E-02



Date:	13.07.2021
Version:	1

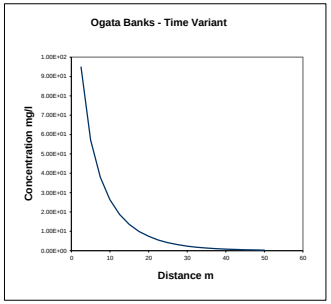
OGATA BANKS SOLUTION

Contaminant	Aromatic C6-C8	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.39E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

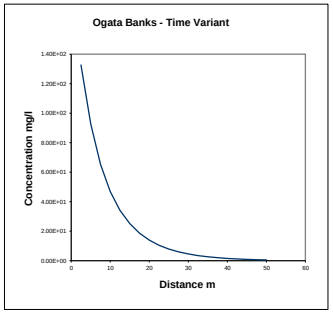
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	9.49E+01
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	5.72E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	3.79E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	2.63E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.88E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.36E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.00E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	7.41E+00
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	5.53E+00
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	4.15E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	3.13E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.37E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.80E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.37E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.04E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	7.95E-01
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	6.07E-01
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	4.65E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.57E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	2.74E-01



Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.33E+02
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	9.26E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	6.53E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	4.69E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	3.42E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.51E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.87E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.40E+01
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.05E+01
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.91E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	5.99E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	4.55E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	3.46E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.64E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	2.01E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.54E+00
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.18E+00
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	9.05E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.95E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.34E-01



Date:	13.07.2021
Version:	1

Contaminant **ıromatic C6-C8**

Input	Value	Units
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.39E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

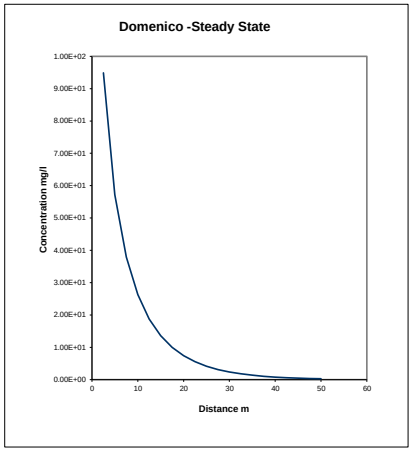
Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

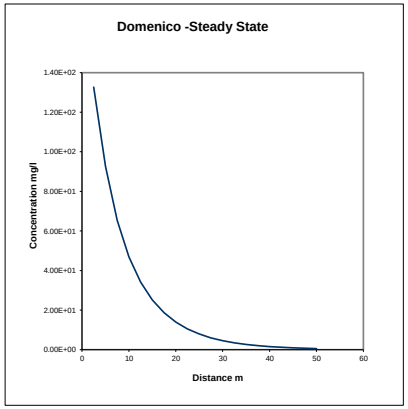
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	9.49E+01
2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	5.72E+01
3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	3.79E+01
4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	2.63E+01
5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.88E+01
6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.36E+01
7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.00E+01
8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	7.41E+00
9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	5.53E+00
10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	4.15E+00
11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.37E+00
13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.80E+00
14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.37E+00
15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.04E+00
16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	7.95E-01
17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	6.07E-01
18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	4.65E-01
19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.57E-01
20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	2.74E-01



DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.33E+02
2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	9.26E+01
3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	6.53E+01
4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	4.69E+01
5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	3.42E+01
6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.51E+01
7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.87E+01
8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.40E+01
9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.91E+00
11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	5.99E+00
12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	4.55E+00
13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	3.46E+00
14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	2.01E+00
16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.54E+00
17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.18E+00
18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	9.05E-01
19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.95E-01
20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.34E-01



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

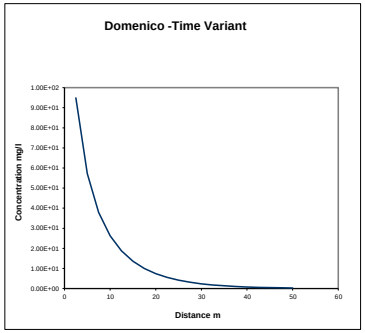
Contaminant Aromatic C6-C8

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.39E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	9.49E+01
2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	5.72E+01
3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	3.79E+01
4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	2.63E+01
5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.88E+01
6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.36E+01
7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.00E+01
8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	7.41E+00
9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	5.53E+00
10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	4.15E+00
11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.37E+00
13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.80E+00
14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.37E+00
15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.04E+00
16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	7.95E-01
17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	6.07E-01
18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	4.65E-01
19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.57E-01
20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	2.74E-01

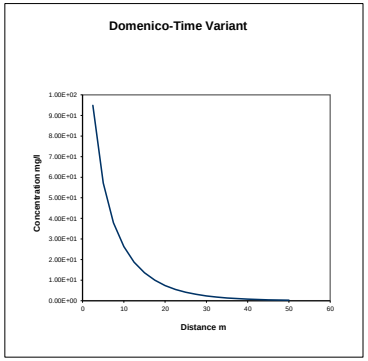


Calc

Value	Units
4.18E-01	m/d
4.15E+01	
1.01E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.33E+02
2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	9.26E+01
3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	6.53E+01
4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	4.69E+01
5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	3.42E+01
6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.51E+01
7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.87E+01
8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.40E+01
9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.91E+00
11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	5.99E+00
12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	4.55E+00
13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	3.46E+00
14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	2.01E+00
16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.54E+00
17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.18E+00
18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	9.05E-01
19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.95E-01
20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.34E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Xylenes			
Target Concentration (C_T)	0.03	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Environment Agency

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Xylenes**		
Target concentration	**C_T**	**0.03**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.12E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	4.90E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.56E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.41E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.03	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Xylenes**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.03** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**9.23E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.33E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Xylenes		from Level 1
Target Concentration	C_T	0.03	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		225	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	9.83E+01	fraction
Decay rate used	λ	5.03E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.30E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	4.80E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**2.04E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	9.56E+00	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.90E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

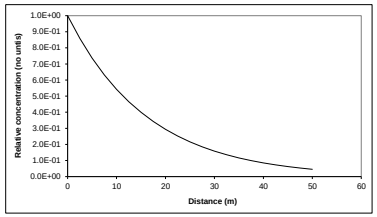
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	1.56E+01
2.5	8.58E-01	1.34E+01
5.0	7.36E-01	1.15E+01
7.5	6.32E-01	9.85E+00
10.0	5.42E-01	8.45E+00
12.5	4.65E-01	7.25E+00
15.0	3.99E-01	6.22E+00
17.5	3.43E-01	5.34E+00
20.0	2.94E-01	4.58E+00
22.5	2.52E-01	3.93E+00
25.0	2.16E-01	3.37E+00
27.5	1.85E-01	2.88E+00
30.0	1.58E-01	2.47E+00
32.5	1.36E-01	2.11E+00
35.0	1.16E-01	1.81E+00
37.5	9.93E-02	1.55E+00
40.0	8.49E-02	1.32E+00
42.5	7.26E-02	1.13E+00
45.0	6.21E-02	9.67E-01
47.5	5.30E-02	8.27E-01
50.0	4.53E-02	7.06E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

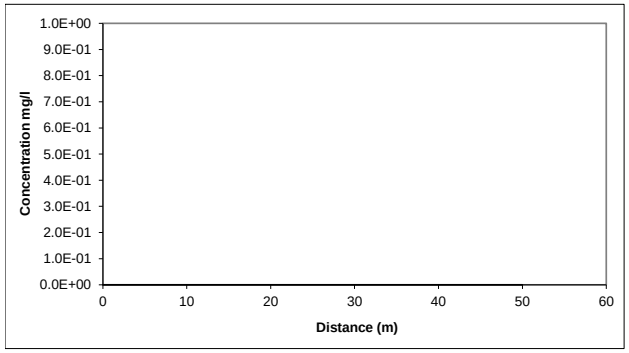
Water filled soil porosity	θ_W	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.12E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	4.56E+00	l/kg
Factor (partitioning between soil and water)		4.69E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Xylenes		from Level 1
Target Concentration	C_T	3.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	3.78E+01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	9.83E+01	fraction
Decay rate used	λ	5.04E-04	d^{-1}
Rate of contaminant flow due to retardation	u	4.25E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	1.94E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**5.86E+00**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**1.94E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.90E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

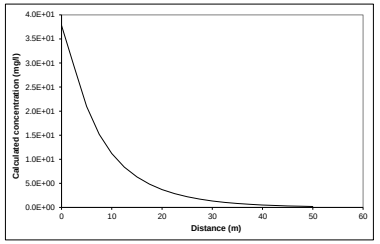
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	3.8E+01
2.5	2.93E+01
5.0	2.10E+01
7.5	1.52E+01
10.0	1.12E+01
12.5	8.37E+00
15.0	6.33E+00
17.5	4.82E+00
20.0	3.70E+00
22.5	2.85E+00
25.0	2.21E+00
27.5	1.72E+00
30.0	1.34E+00
32.5	1.04E+00
35.0	8.18E-01
37.5	6.41E-01
40.0	5.03E-01
42.5	3.96E-01
45.0	3.12E-01
47.5	2.46E-01
50.0	1.94E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Xylenes**

Parameter	Value	Units
(carried over from input sheet)		
C_T	3.00E-02	mg/l
Kd	4.56E+00	l/kg
foc	9.30E-03	fraction
koc	4.90E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.12E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			4.56E+00	l/kg

Calculated Remedial Target	**1.41E-01**	**mg/kg**	**for**	**Xylenes**

Factor (partitioning between soil and water) 4.69E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Xylenes**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	3.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

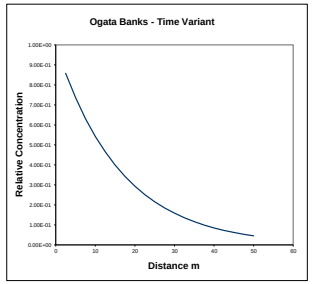
OGATA BANKS SOLUTION

Contaminant	Xylenes

Input	Value	Units
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.035E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

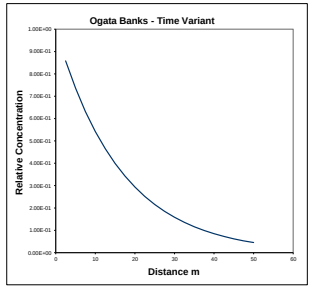
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-9.05E+47	2	6.53E-01	1.92E+00	9.05E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-9.05E+47	2	1.31E+00	3.69E+00	9.05E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-9.05E+47	2	1.96E+00	7.09E+00	9.05E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-9.05E+47	2	2.61E+00	1.36E+01	9.05E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-9.05E+47	2	3.26E+00	2.62E+01	9.05E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-9.05E+47	2	3.92E+00	5.03E+01	9.05E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-9.05E+47	2	4.57E+00	9.66E+01	9.05E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-9.05E+47	2	5.22E+00	1.86E+02	9.05E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-9.05E+47	2	5.88E+00	3.57E+02	9.05E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-9.05E+47	2	6.53E+00	6.85E+02	9.05E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-9.05E+47	2	7.18E+00	1.32E+03	9.05E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-9.05E+47	2	7.84E+00	2.53E+03	9.05E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-9.05E+47	2	8.49E+00	4.86E+03	9.05E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-9.05E+47	2	9.14E+00	9.34E+03	9.05E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-9.05E+47	2	9.79E+00	1.79E+04	9.05E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-9.05E+47	2	1.04E+01	3.45E+04	9.05E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-9.05E+47	2	1.11E+01	6.62E+04	9.05E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-9.05E+47	2	1.18E+01	1.27E+05	9.05E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-9.05E+47	2	1.24E+01	2.44E+05	9.05E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-9.05E+47	2	1.31E+01	4.70E+05	9.05E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	98.3342	
u	0.0063	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-9.05E+47	2	6.53E-01	1.92E+00	9.05E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-9.05E+47	2	1.31E+00	3.69E+00	9.05E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-9.05E+47	2	1.96E+00	7.09E+00	9.05E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-9.05E+47	2	2.61E+00	1.36E+01	9.05E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-9.05E+47	2	3.26E+00	2.62E+01	9.05E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-9.05E+47	2	3.92E+00	5.03E+01	9.05E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-9.05E+47	2	4.57E+00	9.66E+01	9.05E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-9.05E+47	2	5.22E+00	1.86E+02	9.05E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-9.05E+47	2	5.88E+00	3.57E+02	9.05E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-9.05E+47	2	6.53E+00	6.85E+02	9.05E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-9.05E+47	2	7.18E+00	1.32E+03	9.05E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-9.05E+47	2	7.84E+00	2.53E+03	9.05E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-9.05E+47	2	8.49E+00	4.86E+03	9.05E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-9.05E+47	2	9.14E+00	9.34E+03	9.05E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-9.05E+47	2	9.79E+00	1.79E+04	9.05E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-9.05E+47	2	1.04E+01	3.45E+04	9.05E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-9.05E+47	2	1.11E+01	6.62E+04	9.05E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-9.05E+47	2	1.18E+01	1.27E+05	9.05E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-9.05E+47	2	1.24E+01	2.44E+05	9.05E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-9.05E+47	2	1.31E+01	4.70E+05	9.05E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



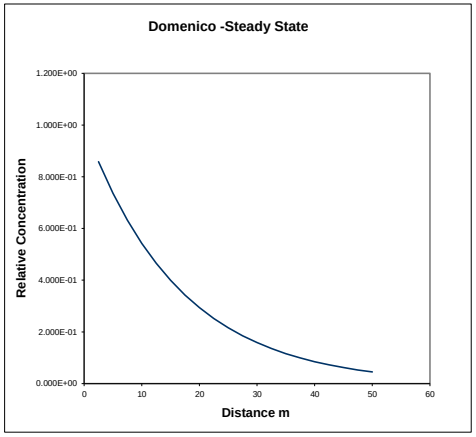
Date:	13.07.2021
Version:	1

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.035E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02

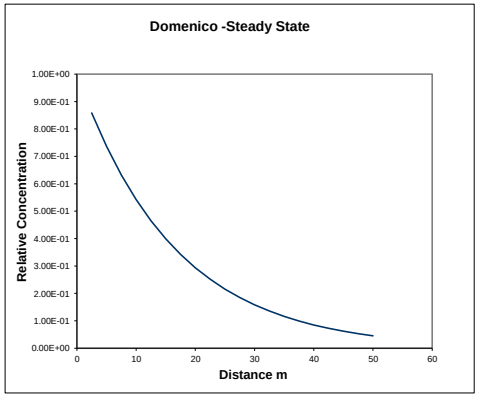


Calc	Value	
v	6.19E-01	m/d
Rc	9.83E+01	
u	6.30E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



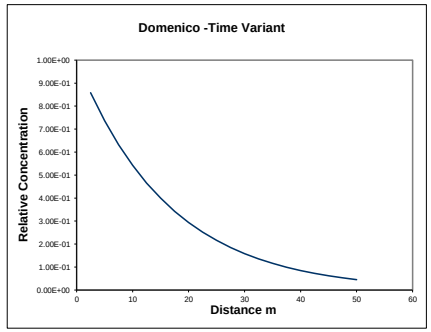
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
DF	3.0774	
λ	5.035E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

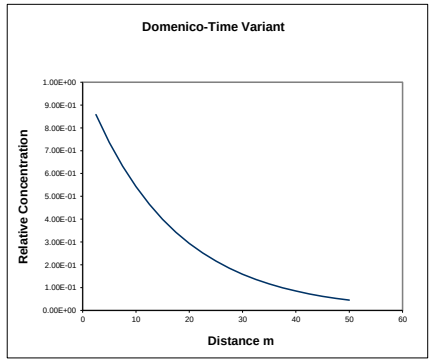
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-9.05E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-9.05E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-9.05E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-9.05E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-9.05E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-9.05E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-9.05E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-9.05E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-9.05E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-9.05E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-9.05E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-9.05E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-9.05E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-9.05E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-9.05E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-9.05E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-9.05E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-9.05E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-9.05E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-9.05E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calc	Value	
v	6.19E-01	m/d
Rc	9.83E+01	
u	6.30E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-9.05E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-9.05E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-9.05E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-9.05E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-9.05E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-9.05E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-9.05E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-9.05E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-9.05E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-9.05E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-9.05E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-9.05E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-9.05E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-9.05E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-9.05E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-9.05E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-9.05E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-9.05E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-9.05E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-9.05E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

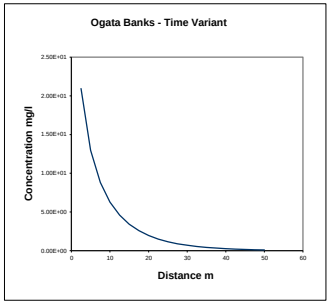
OGATA BANKS SOLUTION

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

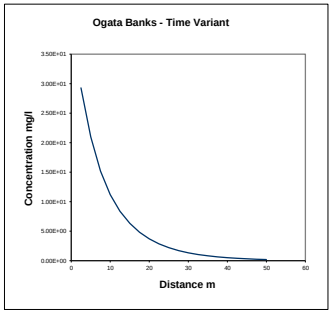
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	4.725	-2.1E-01	8.1E-01	-2.7E+48	2.000	7.1E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.09E+01
2	5	4.725	-4.2E-01	6.6E-01	-2.7E+48	2.000	1.4E+00	4.1E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.30E+01
3	7.5	4.725	-6.3E-01	5.3E-01	-2.7E+48	2.000	2.1E+00	8.4E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	8.82E+00
4	10	4.725	-8.4E-01	4.3E-01	-2.7E+48	2.000	2.8E+00	1.7E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	6.28E+00
5	12.5	4.725	-1.0E+00	3.5E-01	-2.7E+48	2.000	3.5E+00	3.5E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	4.59E+00
6	15	4.725	-1.3E+00	2.9E-01	-2.7E+48	2.000	4.3E+00	7.0E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	3.42E+00
7	17.5	4.725	-1.5E+00	2.3E-01	-2.7E+48	2.000	5.0E+00	1.4E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	2.58E+00
8	20	4.725	-1.7E+00	1.9E-01	-2.7E+48	2.000	5.7E+00	2.9E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	1.96E+00
9	22.5	4.725	-1.9E+00	1.5E-01	-2.7E+48	2.000	6.4E+00	5.9E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	1.50E+00
10	25	4.725	-2.1E+00	1.2E-01	-2.7E+48	2.000	7.1E+00	1.2E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.16E+00
11	27.5	4.725	-2.3E+00	1.0E-01	-2.7E+48	2.000	7.8E+00	2.4E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	8.97E-01
12	30	4.725	-2.5E+00	8.2E-02	-2.7E+48	2.000	8.5E+00	4.9E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	6.97E-01
13	32.5	4.725	-2.7E+00	6.6E-02	-2.7E+48	2.000	9.2E+00	1.0E+04	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	5.42E-01
14	35	4.725	-2.9E+00	5.4E-02	-2.7E+48	2.000	9.9E+00	2.0E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	4.23E-01
15	37.5	4.725	-3.1E+00	4.4E-02	-2.7E+48	2.000	1.1E+01	4.1E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	3.31E-01
16	40	4.725	-3.3E+00	3.5E-02	-2.7E+48	2.000	1.1E+01	8.4E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	2.60E-01
17	42.5	4.725	-3.5E+00	2.9E-02	-2.7E+48	2.000	1.2E+01	1.7E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	2.04E-01
18	45	4.725	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	3.5E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.60E-01
19	47.5	4.725	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.3E+01	7.1E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.26E-01
20	50	4.725	-4.2E+00	1.5E-02	-2.7E+48	2.000	1.4E+01	1.4E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	9.92E-02



Calc	Value	
v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	4.725	-2.1E-01	8.1E-01	-2.7E+48	2.000	7.1E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	2.93E+01
2	5	4.725	-4.2E-01	6.6E-01	-2.7E+48	2.000	1.4E+00	4.1E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	2.10E+01
3	7.5	4.725	-6.3E-01	5.3E-01	-2.7E+48	2.000	2.1E+00	8.4E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.52E+01
4	10	4.725	-8.4E-01	4.3E-01	-2.7E+48	2.000	2.8E+00	1.7E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.12E+01
5	12.5	4.725	-1.0E+00	3.5E-01	-2.7E+48	2.000	3.5E+00	3.5E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	8.37E+00
6	15	4.725	-1.3E+00	2.9E-01	-2.7E+48	2.000	4.3E+00	7.0E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	6.33E+00
7	17.5	4.725	-1.5E+00	2.3E-01	-2.7E+48	2.000	5.0E+00	1.4E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	4.82E+00
8	20	4.725	-1.7E+00	1.9E-01	-2.7E+48	2.000	5.7E+00	2.9E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	3.70E+00
9	22.5	4.725	-1.9E+00	1.5E-01	-2.7E+48	2.000	6.4E+00	5.9E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	2.85E+00
10	25	4.725	-2.1E+00	1.2E-01	-2.7E+48	2.000	7.1E+00	1.2E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	2.21E+00
11	27.5	4.725	-2.3E+00	1.0E-01	-2.7E+48	2.000	7.8E+00	2.4E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.72E+00
12	30	4.725	-2.5E+00	8.2E-02	-2.7E+48	2.000	8.5E+00	4.9E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.34E+00
13	32.5	4.725	-2.7E+00	6.6E-02	-2.7E+48	2.000	9.2E+00	1.0E+04	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.04E+00
14	35	4.725	-2.9E+00	5.4E-02	-2.7E+48	2.000	9.9E+00	2.0E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	8.18E-01
15	37.5	4.725	-3.1E+00	4.4E-02	-2.7E+48	2.000	1.1E+01	4.1E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	6.41E-01
16	40	4.725	-3.3E+00	3.5E-02	-2.7E+48	2.000	1.1E+01	8.4E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	5.03E-01
17	42.5	4.725	-3.5E+00	2.9E-02	-2.7E+48	2.000	1.2E+01	1.7E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	3.96E-01
18	45	4.725	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	3.5E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.12E-01
19	47.5	4.725	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.3E+01	7.1E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	2.46E-01
20	50	4.725	-4.2E+00	1.5E-02	-2.7E+48	2.000	1.4E+01	1.4E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	1.94E-01



Date:	13.07.2021
Version:	1

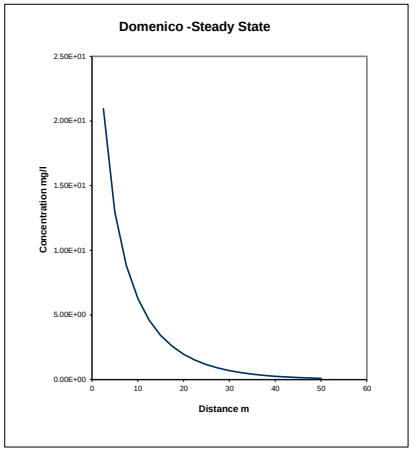
DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	9.45	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.09E+01
2	5	9.45	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.30E+01
3	7.5	9.45	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	8.82E+00
4	10	9.45	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	6.28E+00
5	12.5	9.45	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	4.59E+00
6	15	9.45	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	3.42E+00
7	17.5	9.45	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	2.58E+00
8	20	9.45	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	1.96E+00
9	22.5	9.45	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	1.50E+00
10	25	9.45	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.16E+00
11	27.5	9.45	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	8.97E-01
12	30	9.45	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	6.97E-01
13	32.5	9.45	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	5.42E-01
14	35	9.45	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	4.23E-01
15	37.5	9.45	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	3.31E-01
16	40	9.45	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	2.60E-01
17	42.5	9.45	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	2.04E-01
18	45	9.45	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.60E-01
19	47.5	9.45	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.26E-01
20	50	9.45	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	9.92E-02

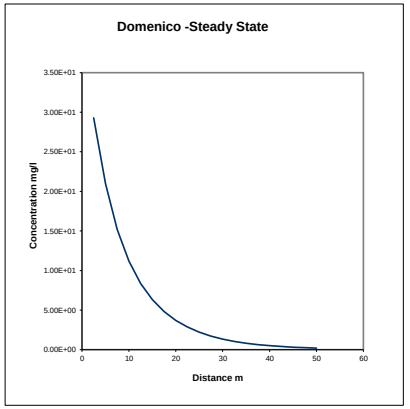


DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc	Value	
v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	9.45	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	2.93E+01
2	5	9.45	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	2.10E+01
3	7.5	9.45	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.52E+01
4	10	9.45	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.12E+01
5	12.5	9.45	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	8.37E+00
6	15	9.45	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	6.33E+00
7	17.5	9.45	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	4.82E+00
8	20	9.45	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	3.70E+00
9	22.5	9.45	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	2.85E+00
10	25	9.45	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	2.21E+00
11	27.5	9.45	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.72E+00
12	30	9.45	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.34E+00
13	32.5	9.45	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.04E+00
14	35	9.45	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	8.18E-01
15	37.5	9.45	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	6.41E-01
16	40	9.45	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	5.03E-01
17	42.5	9.45	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	3.96E-01
18	45	9.45	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.12E-01
19	47.5	9.45	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	2.46E-01
20	50	9.45	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	1.94E-01



Date:	13.07.2021
Version:	1

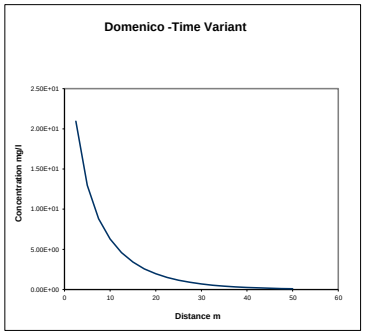
DOMENICO (TIME VARIANT)

Contaminant **Xylenes**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	4.725	-2.09E-01	8.12E-01	-2.68E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.09E+01
2	5	4.725	-4.18E-01	6.59E-01	-2.68E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.30E+01
3	7.5	4.725	-6.26E-01	5.35E-01	-2.68E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	8.82E+00
4	10	4.725	-8.35E-01	4.34E-01	-2.68E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	6.28E+00
5	12.5	4.725	-1.04E+00	3.52E-01	-2.68E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	4.59E+00
6	15	4.725	-1.25E+00	2.86E-01	-2.68E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	3.42E+00
7	17.5	4.725	-1.46E+00	2.32E-01	-2.68E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	2.58E+00
8	20	4.725	-1.67E+00	1.88E-01	-2.68E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	1.96E+00
9	22.5	4.725	-1.88E+00	1.53E-01	-2.68E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	1.50E+00
10	25	4.725	-2.09E+00	1.24E-01	-2.68E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.16E+00
11	27.5	4.725	-2.30E+00	1.01E-01	-2.68E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	8.97E-01
12	30	4.725	-2.51E+00	8.16E-02	-2.68E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	6.97E-01
13	32.5	4.725	-2.71E+00	6.62E-02	-2.68E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	5.42E-01
14	35	4.725	-2.92E+00	5.38E-02	-2.68E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	4.23E-01
15	37.5	4.725	-3.13E+00	4.36E-02	-2.68E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	3.31E-01
16	40	4.725	-3.34E+00	3.54E-02	-2.68E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	2.60E-01
17	42.5	4.725	-3.55E+00	2.87E-02	-2.68E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	2.04E-01
18	45	4.725	-3.76E+00	2.33E-02	-2.68E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.60E-01
19	47.5	4.725	-3.97E+00	1.89E-02	-2.68E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.26E-01
20	50	4.725	-4.18E+00	1.54E-02	-2.68E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	9.92E-02

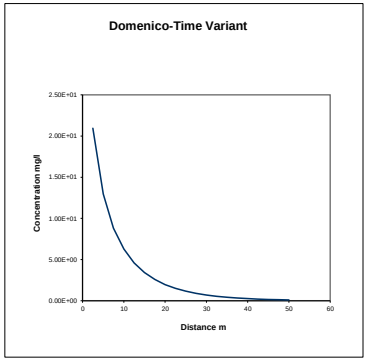


Vertical dispersion option Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	4.725	-2.09E-01	8.12E-01	-2.68E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	2.93E+01
2	5	4.725	-4.18E-01	6.59E-01	-2.68E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	2.10E+01
3	7.5	4.725	-6.26E-01	5.35E-01	-2.68E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.52E+01
4	10	4.725	-8.35E-01	4.34E-01	-2.68E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.12E+01
5	12.5	4.725	-1.04E+00	3.52E-01	-2.68E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	8.37E+00
6	15	4.725	-1.25E+00	2.86E-01	-2.68E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	6.33E+00
7	17.5	4.725	-1.46E+00	2.32E-01	-2.68E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	4.82E+00
8	20	4.725	-1.67E+00	1.88E-01	-2.68E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	3.70E+00
9	22.5	4.725	-1.88E+00	1.53E-01	-2.68E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	2.85E+00
10	25	4.725	-2.09E+00	1.24E-01	-2.68E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	2.21E+00
11	27.5	4.725	-2.30E+00	1.01E-01	-2.68E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.72E+00
12	30	4.725	-2.51E+00	8.16E-02	-2.68E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.34E+00
13	32.5	4.725	-2.71E+00	6.62E-02	-2.68E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.04E+00
14	35	4.725	-2.92E+00	5.38E-02	-2.68E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	8.18E-01
15	37.5	4.725	-3.13E+00	4.36E-02	-2.68E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	6.41E-01
16	40	4.725	-3.34E+00	3.54E-02	-2.68E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	5.03E-01
17	42.5	4.725	-3.55E+00	2.87E-02	-2.68E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	3.96E-01
18	45	4.725	-3.76E+00	2.33E-02	-2.68E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.12E-01
19	47.5	4.725	-3.97E+00	1.89E-02	-2.68E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	2.46E-01
20	50	4.725	-4.18E+00	1.54E-02	-2.68E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	1.94E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aro C10-C12			
Target Concentration (C_T)	0.09	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aro C10-C12**		
Target concentration	**C_T**	**0.09**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	7.22E-02	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.51E+03	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**2.34E+01**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**2.11E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.09	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aro C10-C12**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.09** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.77E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		6.50E+00	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Aro C10-C12		from Level 1
Target Concentration	C_T	0.09	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		658	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.37E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	5.08E+02	fraction
Decay rate used	λ	9.75E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	1.22E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	2.80E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**6.11E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.44E+02	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.55E+03	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	2.37E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

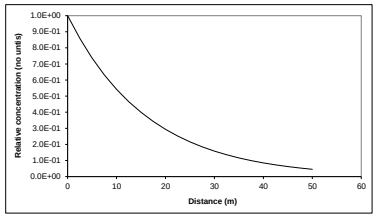
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	9.10E+00
2.5	8.58E-01	7.81E+00
5.0	7.36E-01	6.70E+00
7.5	6.32E-01	5.75E+00
10.0	5.42E-01	4.94E+00
12.5	4.65E-01	4.24E+00
15.0	3.99E-01	3.64E+00
17.5	3.43E-01	3.12E+00
20.0	2.94E-01	2.68E+00
22.5	2.52E-01	2.29E+00
25.0	2.16E-01	1.97E+00
27.5	1.85E-01	1.68E+00
30.0	1.58E-01	1.44E+00
32.5	1.36E-01	1.24E+00
35.0	1.16E-01	1.06E+00
37.5	9.93E-02	9.04E-01
40.0	8.49E-02	7.73E-01
42.5	7.26E-02	6.61E-01
45.0	6.21E-02	5.65E-01
47.5	5.30E-02	4.83E-01
50.0	4.53E-02	4.12E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

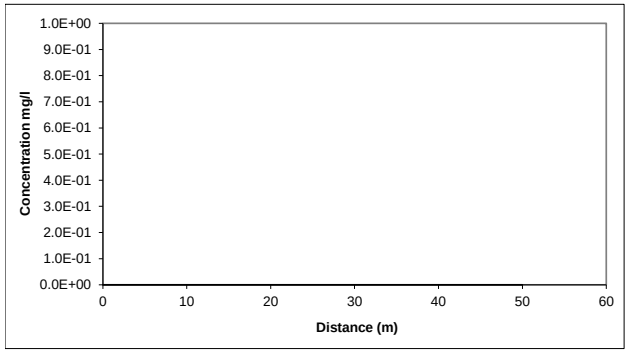
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	7.22E-02	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	2.34E+01	l/kg
Factor (partitioning between soil and water)		2.35E+01	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aro C10-C12		from Level 1
Target Concentration	C_T	9.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.20E+00	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.37E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	5.08E+02	fraction
Decay rate used	λ	9.75E-05	d^{-1}
Rate of contaminant flow due to retardation	u	8.23E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	6.15E-03	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**1.76E+01**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**6.15E-03**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.55E+03	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	2.37E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

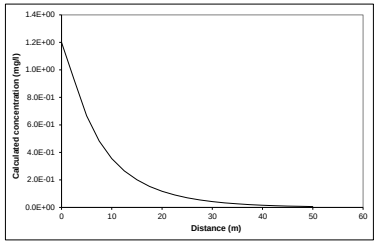
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.2E+00
2.5	9.30E-01
5.0	6.66E-01
7.5	4.82E-01
10.0	3.55E-01
12.5	2.66E-01
15.0	2.01E-01
17.5	1.53E-01
20.0	1.17E-01
22.5	9.06E-02
25.0	7.01E-02
27.5	5.45E-02
30.0	4.25E-02
32.5	3.32E-02
35.0	2.60E-02
37.5	2.04E-02
40.0	1.60E-02
42.5	1.26E-02
45.0	9.89E-03
47.5	7.79E-03
50.0	6.15E-03

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aro C10-C12**

Parameter	Value	Units
(carried over from input sheet)		
C_T	9.00E-02	mg/l
Kd	2.34E+01	l/kg
foc	9.30E-03	fraction
koc	2.51E+03	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	7.22E-02	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			2.34E+01	l/kg

Calculated Remedial Target	**2.11E+00**	**mg/kg**	**for**	**Aro C10-C12**

Factor (partitioning between soil and water) 2.35E+01

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aro C10-C12**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	9.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

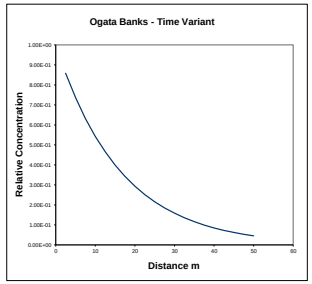
Contaminant **Aro C10-C12**

OGATA BANKS SOLUTION

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	9.000E-02	mg/l
DF	3.077E+00	
λ	9.749E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.372E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

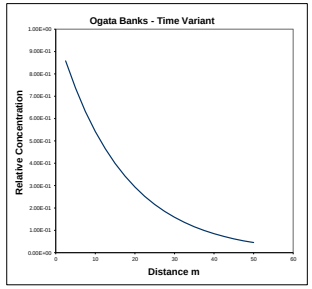
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.98E+47	2	6.53E-01	1.92E+00	3.98E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.98E+47	2	1.31E+00	3.69E+00	3.98E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.98E+47	2	1.96E+00	7.09E+00	3.98E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.98E+47	2	2.61E+00	1.36E+01	3.98E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.98E+47	2	3.26E+00	2.62E+01	3.98E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.98E+47	2	3.92E+00	5.03E+01	3.98E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.98E+47	2	4.57E+00	9.66E+01	3.98E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.98E+47	2	5.22E+00	1.86E+02	3.98E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.98E+47	2	5.88E+00	3.57E+02	3.98E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.98E+47	2	6.53E+00	6.85E+02	3.98E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.98E+47	2	7.18E+00	1.32E+03	3.98E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.98E+47	2	7.84E+00	2.53E+03	3.98E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.98E+47	2	8.49E+00	4.86E+03	3.98E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.98E+47	2	9.14E+00	9.34E+03	3.98E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.98E+47	2	9.79E+00	1.79E+04	3.98E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.98E+47	2	1.04E+01	3.45E+04	3.98E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.98E+47	2	1.11E+01	6.62E+04	3.98E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.98E+47	2	1.18E+01	1.27E+05	3.98E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.98E+47	2	1.24E+01	2.44E+05	3.98E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.98E+47	2	1.31E+01	4.70E+05	3.98E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	507.8373	
u	0.0012	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-3.98E+47	2	6.53E-01	1.92E+00	3.98E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-3.98E+47	2	1.31E+00	3.69E+00	3.98E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-3.98E+47	2	1.96E+00	7.09E+00	3.98E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-3.98E+47	2	2.61E+00	1.36E+01	3.98E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-3.98E+47	2	3.26E+00	2.62E+01	3.98E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-3.98E+47	2	3.92E+00	5.03E+01	3.98E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-3.98E+47	2	4.57E+00	9.66E+01	3.98E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-3.98E+47	2	5.22E+00	1.86E+02	3.98E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-3.98E+47	2	5.88E+00	3.57E+02	3.98E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-3.98E+47	2	6.53E+00	6.85E+02	3.98E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-3.98E+47	2	7.18E+00	1.32E+03	3.98E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-3.98E+47	2	7.84E+00	2.53E+03	3.98E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-3.98E+47	2	8.49E+00	4.86E+03	3.98E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-3.98E+47	2	9.14E+00	9.34E+03	3.98E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-3.98E+47	2	9.79E+00	1.79E+04	3.98E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-3.98E+47	2	1.04E+01	3.45E+04	3.98E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-3.98E+47	2	1.11E+01	6.62E+04	3.98E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-3.98E+47	2	1.18E+01	1.27E+05	3.98E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-3.98E+47	2	1.24E+01	2.44E+05	3.98E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-3.98E+47	2	1.31E+01	4.70E+05	3.98E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

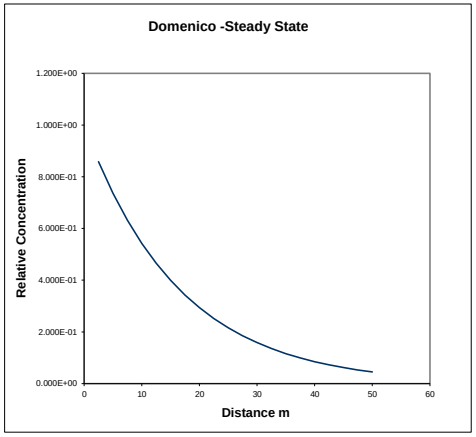
Contaminant **Aro C10-C12**

Input	Value	Units
C_T	9.000E-02	mg/l
DF	3.077E+00	
λ	9.749E-05	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.372E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



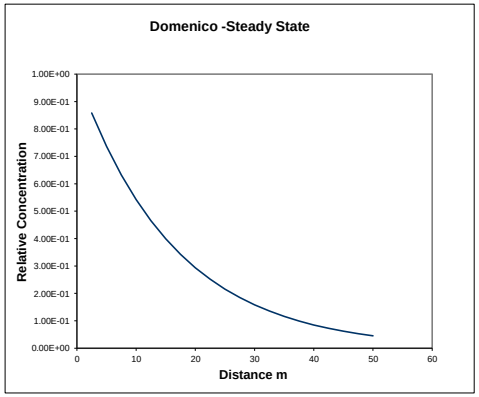
Calc **Value**

v	6.19E-01	m/d
Rc	5.08E+02	
u	1.22E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

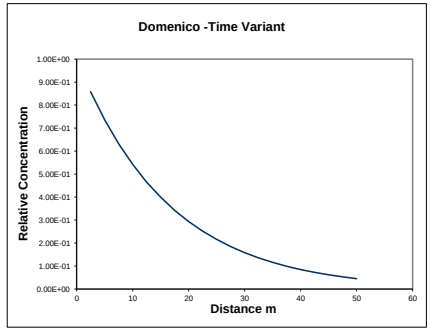
DOMENICO (TIME VARIANT)

Contaminant **Aro C10-C12**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.09	mg/l
DF	3.0774	
λ	9.749E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	2.372E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.98E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.98E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.98E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.98E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.98E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.98E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.98E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.98E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.98E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.98E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.98E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.98E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.98E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.98E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.98E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.98E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.98E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.98E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.98E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.98E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02

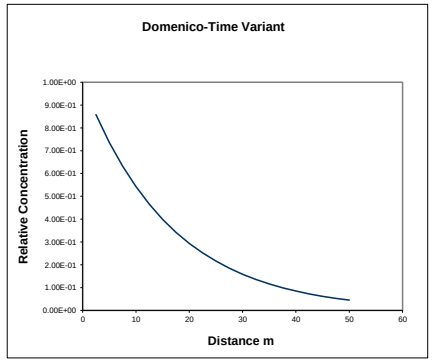


Calc **Value**

v	6.19E-01	m/d
Rc	5.08E+02	
u	1.22E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-3.98E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-3.98E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-3.98E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-3.98E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-3.98E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-3.98E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-3.98E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-3.98E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-3.98E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-3.98E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-3.98E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-3.98E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-3.98E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-3.98E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-3.98E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-3.98E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-3.98E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-3.98E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-3.98E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-3.98E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

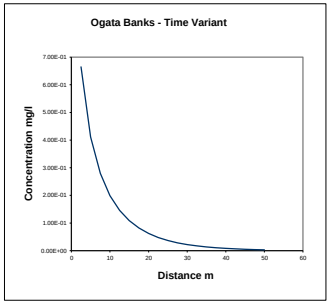
Contaminant	Aro C10-C12	
Input	**Value**	**Units**
C_T	0.09	mg/l
Co	1.20E+00	mg/l
λ	9.75E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.37E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	5.08E+02	
u	8.23E-04	m/d

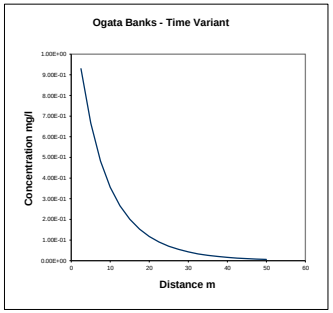
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.15	-2.1E-01	8.1E-01	-1.2E+48	2.000	7.1E-01	2.0E+00	1.2E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	6.65E-01
2	5	0.15	-4.2E-01	6.6E-01	-1.2E+48	2.000	1.4E+00	4.1E+00	1.2E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	4.11E-01
3	7.5	0.15	-6.3E-01	5.3E-01	-1.2E+48	2.000	2.1E+00	8.4E+00	1.2E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	2.80E-01
4	10	0.15	-8.4E-01	4.3E-01	-1.2E+48	2.000	2.8E+00	1.7E+01	1.2E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.99E-01
5	12.5	0.15	-1.0E+00	3.5E-01	-1.2E+48	2.000	3.5E+00	3.5E+01	1.2E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.46E-01
6	15	0.15	-1.3E+00	2.9E-01	-1.2E+48	2.000	4.3E+00	7.0E+01	1.2E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.09E-01
7	17.5	0.15	-1.5E+00	2.3E-01	-1.2E+48	2.000	5.0E+00	1.4E+02	1.2E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	8.19E-02
8	20	0.15	-1.7E+00	1.9E-01	-1.2E+48	2.000	5.7E+00	2.9E+02	1.2E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	6.23E-02
9	22.5	0.15	-1.9E+00	1.5E-01	-1.2E+48	2.000	6.4E+00	5.9E+02	1.2E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.78E-02
10	25	0.15	-2.1E+00	1.2E-01	-1.2E+48	2.000	7.1E+00	1.2E+03	1.2E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	3.68E-02
11	27.5	0.15	-2.3E+00	1.0E-01	-1.2E+48	2.000	7.8E+00	2.4E+03	1.2E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	2.85E-02
12	30	0.15	-2.5E+00	8.2E-02	-1.2E+48	2.000	8.5E+00	4.9E+03	1.2E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.21E-02
13	32.5	0.15	-2.7E+00	6.6E-02	-1.2E+48	2.000	9.2E+00	1.0E+04	1.2E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.72E-02
14	35	0.15	-2.9E+00	5.4E-02	-1.2E+48	2.000	9.9E+00	2.0E+04	1.2E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.34E-02
15	37.5	0.15	-3.1E+00	4.4E-02	-1.2E+48	2.000	1.1E+01	4.1E+04	1.2E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.05E-02
16	40	0.15	-3.3E+00	3.5E-02	-1.2E+48	2.000	1.1E+01	8.4E+04	1.2E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	8.24E-03
17	42.5	0.15	-3.5E+00	2.9E-02	-1.2E+48	2.000	1.2E+01	1.7E+05	1.2E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	6.47E-03
18	45	0.15	-3.8E+00	2.3E-02	-1.2E+48	2.000	1.3E+01	3.5E+05	1.2E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	5.08E-03
19	47.5	0.15	-4.0E+00	1.9E-02	-1.2E+48	2.000	1.3E+01	7.1E+05	1.2E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	4.00E-03
20	50	0.15	-4.2E+00	1.5E-02	-1.2E+48	2.000	1.4E+01	1.4E+06	1.2E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.15E-03



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.15	-2.1E-01	8.1E-01	-1.2E+48	2.000	7.1E-01	2.0E+00	1.2E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	9.30E-01
2	5	0.15	-4.2E-01	6.6E-01	-1.2E+48	2.000	1.4E+00	4.1E+00	1.2E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	6.66E-01
3	7.5	0.15	-6.3E-01	5.3E-01	-1.2E+48	2.000	2.1E+00	8.4E+00	1.2E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	4.82E-01
4	10	0.15	-8.4E-01	4.3E-01	-1.2E+48	2.000	2.8E+00	1.7E+01	1.2E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	3.55E-01
5	12.5	0.15	-1.0E+00	3.5E-01	-1.2E+48	2.000	3.5E+00	3.5E+01	1.2E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.66E-01
6	15	0.15	-1.3E+00	2.9E-01	-1.2E+48	2.000	4.3E+00	7.0E+01	1.2E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.01E-01
7	17.5	0.15	-1.5E+00	2.3E-01	-1.2E+48	2.000	5.0E+00	1.4E+02	1.2E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.53E-01
8	20	0.15	-1.7E+00	1.9E-01	-1.2E+48	2.000	5.7E+00	2.9E+02	1.2E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.17E-01
9	22.5	0.15	-1.9E+00	1.5E-01	-1.2E+48	2.000	6.4E+00	5.9E+02	1.2E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	9.06E-02
10	25	0.15	-2.1E+00	1.2E-01	-1.2E+48	2.000	7.1E+00	1.2E+03	1.2E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.01E-02
11	27.5	0.15	-2.3E+00	1.0E-01	-1.2E+48	2.000	7.8E+00	2.4E+03	1.2E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	5.45E-02
12	30	0.15	-2.5E+00	8.2E-02	-1.2E+48	2.000	8.5E+00	4.9E+03	1.2E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	4.25E-02
13	32.5	0.15	-2.7E+00	6.6E-02	-1.2E+48	2.000	9.2E+00	1.0E+04	1.2E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	3.32E-02
14	35	0.15	-2.9E+00	5.4E-02	-1.2E+48	2.000	9.9E+00	2.0E+04	1.2E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.60E-02
15	37.5	0.15	-3.1E+00	4.4E-02	-1.2E+48	2.000	1.1E+01	4.1E+04	1.2E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	2.04E-02
16	40	0.15	-3.3E+00	3.5E-02	-1.2E+48	2.000	1.1E+01	8.4E+04	1.2E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.60E-02
17	42.5	0.15	-3.5E+00	2.9E-02	-1.2E+48	2.000	1.2E+01	1.7E+05	1.2E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.26E-02
18	45	0.15	-3.8E+00	2.3E-02	-1.2E+48	2.000	1.3E+01	3.5E+05	1.2E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	9.89E-03
19	47.5	0.15	-4.0E+00	1.9E-02	-1.2E+48	2.000	1.3E+01	7.1E+05	1.2E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	7.79E-03
20	50	0.15	-4.2E+00	1.5E-02	-1.2E+48	2.000	1.4E+01	1.4E+06	1.2E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	6.15E-03



Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

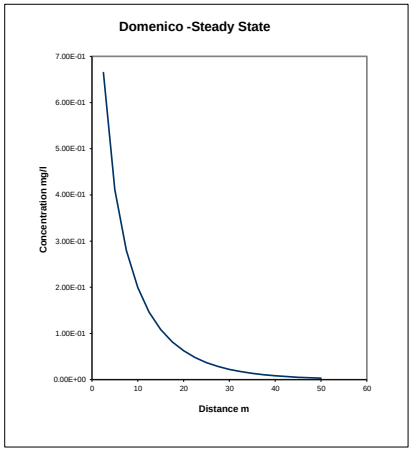
Contaminant **Aro C10-C12**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.09	mg/l
Co	1.20E+00	mg/l
λ	9.75E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.37E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	6.65E-01
2	5	0.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	4.11E-01
3	7.5	0.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	2.80E-01
4	10	0.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.99E-01
5	12.5	0.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.46E-01
6	15	0.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.09E-01
7	17.5	0.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	8.19E-02
8	20	0.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	6.23E-02
9	22.5	0.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.78E-02
10	25	0.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	3.68E-02
11	27.5	0.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	2.85E-02
12	30	0.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.21E-02
13	32.5	0.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.72E-02
14	35	0.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.34E-02
15	37.5	0.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.05E-02
16	40	0.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	8.24E-03
17	42.5	0.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	6.47E-03
18	45	0.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	5.08E-03
19	47.5	0.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	4.00E-03
20	50	0.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.15E-03



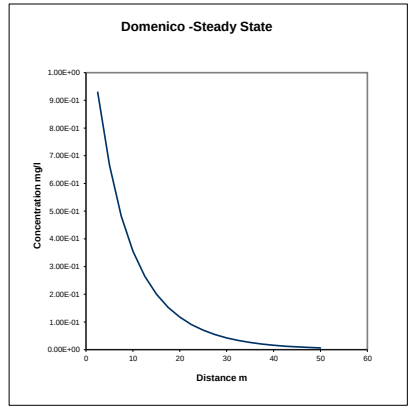
DOMENICO (STEADY STATE)

Calc **Value**

v	4.18E-01	m/d
Rc	5.08E+02	
u	8.23E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.3	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	9.30E-01
2	5	0.3	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	6.66E-01
3	7.5	0.3	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	4.82E-01
4	10	0.3	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	3.55E-01
5	12.5	0.3	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.66E-01
6	15	0.3	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.01E-01
7	17.5	0.3	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.53E-01
8	20	0.3	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.17E-01
9	22.5	0.3	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	9.06E-02
10	25	0.3	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.01E-02
11	27.5	0.3	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	5.45E-02
12	30	0.3	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	4.25E-02
13	32.5	0.3	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	3.32E-02
14	35	0.3	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.60E-02
15	37.5	0.3	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	2.04E-02
16	40	0.3	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.60E-02
17	42.5	0.3	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.26E-02
18	45	0.3	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	9.89E-03
19	47.5	0.3	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	7.79E-03
20	50	0.3	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	6.15E-03



Date:	13.07.2021
Version:	1

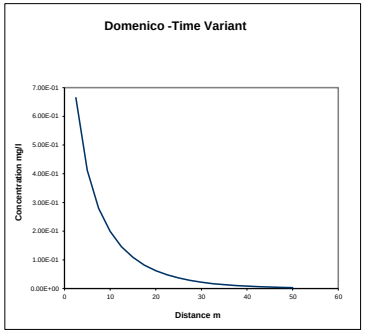
DOMENICO (TIME VARIANT)

Contaminant **Aro C10-C12**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.09	mg/l
Co	1.20E+00	mg/l
λ	9.75E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	2.37E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.15	-2.09E-01	8.12E-01	-1.18E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	6.65E-01
2	5	0.15	-4.18E-01	6.59E-01	-1.18E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	4.11E-01
3	7.5	0.15	-6.26E-01	5.35E-01	-1.18E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	2.80E-01
4	10	0.15	-8.35E-01	4.34E-01	-1.18E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.99E-01
5	12.5	0.15	-1.04E+00	3.52E-01	-1.18E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.46E-01
6	15	0.15	-1.25E+00	2.86E-01	-1.18E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.09E-01
7	17.5	0.15	-1.46E+00	2.32E-01	-1.18E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	8.19E-02
8	20	0.15	-1.67E+00	1.88E-01	-1.18E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	6.23E-02
9	22.5	0.15	-1.88E+00	1.53E-01	-1.18E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.78E-02
10	25	0.15	-2.09E+00	1.24E-01	-1.18E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	3.68E-02
11	27.5	0.15	-2.30E+00	1.01E-01	-1.18E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	2.85E-02
12	30	0.15	-2.51E+00	8.16E-02	-1.18E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.21E-02
13	32.5	0.15	-2.71E+00	6.62E-02	-1.18E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.72E-02
14	35	0.15	-2.92E+00	5.38E-02	-1.18E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.34E-02
15	37.5	0.15	-3.13E+00	4.36E-02	-1.18E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.05E-02
16	40	0.15	-3.34E+00	3.54E-02	-1.18E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	8.24E-03
17	42.5	0.15	-3.55E+00	2.87E-02	-1.18E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	6.47E-03
18	45	0.15	-3.76E+00	2.33E-02	-1.18E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	5.08E-03
19	47.5	0.15	-3.97E+00	1.89E-02	-1.18E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	4.00E-03
20	50	0.15	-4.18E+00	1.54E-02	-1.18E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.15E-03



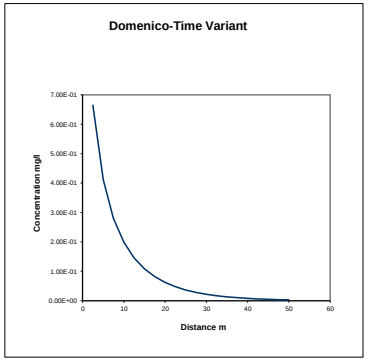
Vertical dispersion option Simulate vertical dispersion in 1 direction

Calc **Value**

v	4.18E-01	m/d
Rc	5.08E+02	
u	8.23E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.15	-2.09E-01	8.12E-01	-1.18E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	9.30E-01
2	5	0.15	-4.18E-01	6.59E-01	-1.18E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	6.66E-01
3	7.5	0.15	-6.26E-01	5.35E-01	-1.18E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	4.82E-01
4	10	0.15	-8.35E-01	4.34E-01	-1.18E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	3.55E-01
5	12.5	0.15	-1.04E+00	3.52E-01	-1.18E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.66E-01
6	15	0.15	-1.25E+00	2.86E-01	-1.18E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.01E-01
7	17.5	0.15	-1.46E+00	2.32E-01	-1.18E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.53E-01
8	20	0.15	-1.67E+00	1.88E-01	-1.18E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.17E-01
9	22.5	0.15	-1.88E+00	1.53E-01	-1.18E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	9.06E-02
10	25	0.15	-2.09E+00	1.24E-01	-1.18E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.01E-02
11	27.5	0.15	-2.30E+00	1.01E-01	-1.18E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	5.45E-02
12	30	0.15	-2.51E+00	8.16E-02	-1.18E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	4.25E-02
13	32.5	0.15	-2.71E+00	6.62E-02	-1.18E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	3.32E-02
14	35	0.15	-2.92E+00	5.38E-02	-1.18E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.60E-02
15	37.5	0.15	-3.13E+00	4.36E-02	-1.18E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	2.04E-02
16	40	0.15	-3.34E+00	3.54E-02	-1.18E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.60E-02
17	42.5	0.15	-3.55E+00	2.87E-02	-1.18E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.26E-02
18	45	0.15	-3.76E+00	2.33E-02	-1.18E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	9.89E-03
19	47.5	0.15	-3.97E+00	1.89E-02	-1.18E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	7.79E-03
20	50	0.15	-4.18E+00	1.54E-02	-1.18E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	6.15E-03



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Aro C12-C16			
Target Concentration (C_T)	0.09	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aro C12-C16**		
Target concentration	C_T	**0.09**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.26E-02	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	5.01E+03	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.66E+01**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**4.21E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.09	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aro C12-C16**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.09** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.77E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.29E+01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Aro C12-C16		from Level 1
Target Concentration	C_T	0.09	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		4486	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	4.10E+01	days	R2174c-R10-App A
Calculated decay rate	λ	1.69E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.66E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	9.97E+02	fraction
Decay rate used	λ	1.70E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.21E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	2.86E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**3.49E+00**	**fraction**
Calculated soil leachate concentration	Co	9.60E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**9.68E-01**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	4.52E+01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**2.86E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	5.01E+03	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.66E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

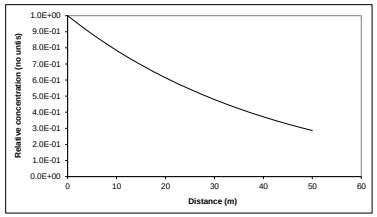
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	3.12E+01
2.5	9.41E-01	2.93E+01
5.0	8.85E-01	2.76E+01
7.5	8.33E-01	2.60E+01
10.0	7.84E-01	2.45E+01
12.5	7.38E-01	2.30E+01
15.0	6.94E-01	2.16E+01
17.5	6.53E-01	2.04E+01
20.0	6.14E-01	1.92E+01
22.5	5.78E-01	1.80E+01
25.0	5.43E-01	1.69E+01
27.5	5.10E-01	1.59E+01
30.0	4.79E-01	1.49E+01
32.5	4.50E-01	1.40E+01
35.0	4.22E-01	1.32E+01
37.5	3.96E-01	1.23E+01
40.0	3.71E-01	1.16E+01
42.5	3.48E-01	1.09E+01
45.0	3.26E-01	1.02E+01
47.5	3.06E-01	9.53E+00
50.0	2.86E-01	8.93E+00

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

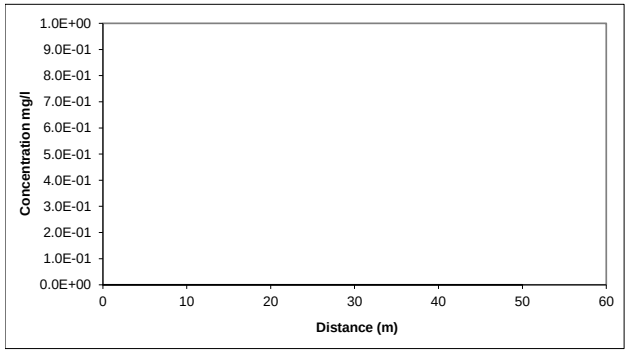
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.26E-02	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	4.66E+01	l/kg
Factor (partitioning between soil and water)		4.67E+01	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	3.49E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Aro C12-C16		from Level 1
Target Concentration	C_T	9.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	4.00E-01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	4.10E+01	days	R2174c-R10-App A
Calculated decay rate	λ	1.69E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.66E+01	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	9.97E+02	fraction
Decay rate used	λ	1.70E-05	d^{-1}
Rate of contaminant flow due to retardation	u	4.20E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	2.38E-02	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.68E+01**	

Remedial Targets

Remedial Target		**1.51E+00**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**2.38E-02**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	5.01E+03	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.66E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

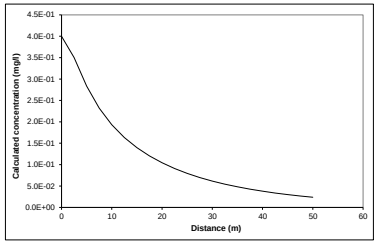
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	4.0E-01
2.5	3.50E-01
5.0	2.84E-01
7.5	2.32E-01
10.0	1.93E-01
12.5	1.63E-01
15.0	1.40E-01
17.5	1.20E-01
20.0	1.04E-01
22.5	9.10E-02
25.0	7.97E-02
27.5	7.00E-02
30.0	6.16E-02
32.5	5.44E-02
35.0	4.82E-02
37.5	4.27E-02
40.0	3.79E-02
42.5	3.37E-02
45.0	3.00E-02
47.5	2.67E-02
50.0	2.38E-02

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Aro C12-C16**

Parameter	Value	Units
(carried over from input sheet)		
C_T	9.00E-02	mg/l
Kd	4.66E+01	l/kg
foc	9.30E-03	fraction
koc	5.01E+03	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.26E-02	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			4.66E+01	l/kg

Calculated Remedial Target	**4.21E+00**	**mg/kg**	**for**	**Aro C12-C16**

Factor (partitioning between soil and water) 4.67E+01

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Aro C12-C16**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	9.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

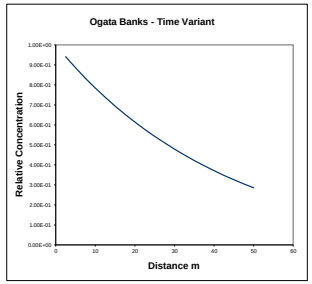
OGATA BANKS SOLUTION

Contaminant **Aro C12-C16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	9.000E-02	mg/l
DF	3.077E+00	
λ	1.696E-05	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.661E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

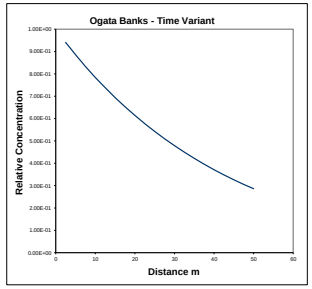
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.08E-02	9.41E-01	-2.19E+47	2	5.61E-01	1.75E+00	2.19E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.41E-01
2	5	0.13	-1.22E-01	8.85E-01	-2.19E+47	2	1.12E+00	3.07E+00	2.19E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.85E-01
3	7.5	0.13	-1.82E-01	8.33E-01	-2.19E+47	2	1.68E+00	5.38E+00	2.19E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.33E-01
4	10	0.13	-2.43E-01	7.84E-01	-2.19E+47	2	2.24E+00	9.42E+00	2.19E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.84E-01
5	12.5	0.13	-3.04E-01	7.38E-01	-2.19E+47	2	2.80E+00	1.65E+01	2.19E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	7.38E-01
6	15	0.13	-3.65E-01	6.94E-01	-2.19E+47	2	3.36E+00	2.89E+01	2.19E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	6.94E-01
7	17.5	0.13	-4.26E-01	6.53E-01	-2.19E+47	2	3.93E+00	5.07E+01	2.19E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	6.53E-01
8	20	0.13	-4.87E-01	6.15E-01	-2.19E+47	2	4.49E+00	8.88E+01	2.19E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.14E-01
9	22.5	0.13	-5.47E-01	5.78E-01	-2.19E+47	2	5.05E+00	1.56E+02	2.19E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	5.78E-01
10	25	0.13	-6.08E-01	5.44E-01	-2.19E+47	2	5.61E+00	2.73E+02	2.19E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	5.43E-01
11	27.5	0.13	-6.69E-01	5.12E-01	-2.19E+47	2	6.17E+00	4.78E+02	2.19E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	5.10E-01
12	30	0.13	-7.30E-01	4.82E-01	-2.19E+47	2	6.73E+00	8.37E+02	2.19E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	4.79E-01
13	32.5	0.13	-7.91E-01	4.54E-01	-2.19E+47	2	7.29E+00	1.47E+03	2.19E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	4.50E-01
14	35	0.13	-8.52E-01	4.27E-01	-2.19E+47	2	7.85E+00	2.57E+03	2.19E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	4.22E-01
15	37.5	0.13	-9.12E-01	4.02E-01	-2.19E+47	2	8.41E+00	4.50E+03	2.19E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	3.96E-01
16	40	0.13	-9.73E-01	3.78E-01	-2.19E+47	2	8.97E+00	7.89E+03	2.19E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	3.71E-01
17	42.5	0.13	-1.03E+00	3.56E-01	-2.19E+47	2	9.53E+00	1.38E+04	2.19E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	3.48E-01
18	45	0.13	-1.09E+00	3.35E-01	-2.19E+47	2	1.01E+01	2.42E+04	2.19E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	3.26E-01
19	47.5	0.13	-1.16E+00	3.15E-01	-2.19E+47	2	1.07E+01	4.24E+04	2.19E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	3.05E-01
20	50	0.13	-1.22E+00	2.96E-01	-2.19E+47	2	1.12E+01	7.43E+04	2.19E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	2.86E-01



Calc	Value	
v	0.6195	m/d
Rc	996.7933	
u	0.0006	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.08E-02	9.41E-01	-2.19E+47	2	5.61E-01	1.75E+00	2.19E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.13	-1.22E-01	8.85E-01	-2.19E+47	2	1.12E+00	3.07E+00	2.19E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.13	-1.82E-01	8.33E-01	-2.19E+47	2	1.68E+00	5.38E+00	2.19E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.13	-2.43E-01	7.84E-01	-2.19E+47	2	2.24E+00	9.42E+00	2.19E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.13	-3.04E-01	7.38E-01	-2.19E+47	2	2.80E+00	1.65E+01	2.19E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.13	-3.65E-01	6.94E-01	-2.19E+47	2	3.36E+00	2.89E+01	2.19E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.13	-4.26E-01	6.53E-01	-2.19E+47	2	3.93E+00	5.07E+01	2.19E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.13	-4.87E-01	6.15E-01	-2.19E+47	2	4.49E+00	8.88E+01	2.19E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.13	-5.47E-01	5.78E-01	-2.19E+47	2	5.05E+00	1.56E+02	2.19E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.13	-6.08E-01	5.44E-01	-2.19E+47	2	5.61E+00	2.73E+02	2.19E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.13	-6.69E-01	5.12E-01	-2.19E+47	2	6.17E+00	4.78E+02	2.19E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.13	-7.30E-01	4.82E-01	-2.19E+47	2	6.73E+00	8.37E+02	2.19E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.13	-7.91E-01	4.54E-01	-2.19E+47	2	7.29E+00	1.47E+03	2.19E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.13	-8.52E-01	4.27E-01	-2.19E+47	2	7.85E+00	2.57E+03	2.19E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.13	-9.12E-01	4.02E-01	-2.19E+47	2	8.41E+00	4.50E+03	2.19E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.13	-9.73E-01	3.78E-01	-2.19E+47	2	8.97E+00	7.89E+03	2.19E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.13	-1.03E+00	3.56E-01	-2.19E+47	2	9.53E+00	1.38E+04	2.19E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.13	-1.09E+00	3.35E-01	-2.19E+47	2	1.01E+01	2.42E+04	2.19E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.13	-1.16E+00	3.15E-01	-2.19E+47	2	1.07E+01	4.24E+04	2.19E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.13	-1.22E+00	2.96E-01	-2.19E+47	2	1.12E+01	7.43E+04	2.19E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	2.86E-01



Date:	13.07.2021
Version:	1

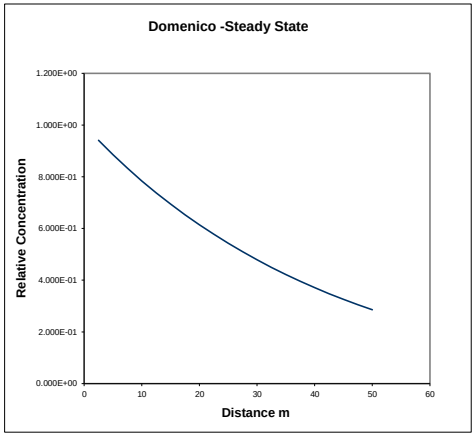
Contaminant **Aro C12-C16**

Input	Value	Units
C_T	9.000E-02	mg/l
DF	3.077E+00	
λ	1.696E-05	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.661E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.08E-02	9.41E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.410E-01
2	5	0.25	-1.22E-01	8.85E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.855E-01
3	7.5	0.25	-1.82E-01	8.33E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.332E-01
4	10	0.25	-2.43E-01	7.84E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.840E-01
5	12.5	0.25	-3.04E-01	7.38E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	7.377E-01
6	15	0.25	-3.65E-01	6.94E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	6.941E-01
7	17.5	0.25	-4.26E-01	6.53E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	6.530E-01
8	20	0.25	-4.87E-01	6.15E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.142E-01
9	22.5	0.25	-5.47E-01	5.78E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	5.775E-01
10	25	0.25	-6.08E-01	5.44E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	5.428E-01
11	27.5	0.25	-6.69E-01	5.12E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	5.100E-01
12	30	0.25	-7.30E-01	4.82E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	4.789E-01
13	32.5	0.25	-7.91E-01	4.54E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	4.496E-01
14	35	0.25	-8.52E-01	4.27E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	4.219E-01
15	37.5	0.25	-9.12E-01	4.02E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	3.957E-01
16	40	0.25	-9.73E-01	3.78E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	3.710E-01
17	42.5	0.25	-1.03E+00	3.56E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	3.477E-01
18	45	0.25	-1.09E+00	3.35E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	3.258E-01
19	47.5	0.25	-1.16E+00	3.15E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	3.051E-01
20	50	0.25	-1.22E+00	2.96E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	2.857E-01



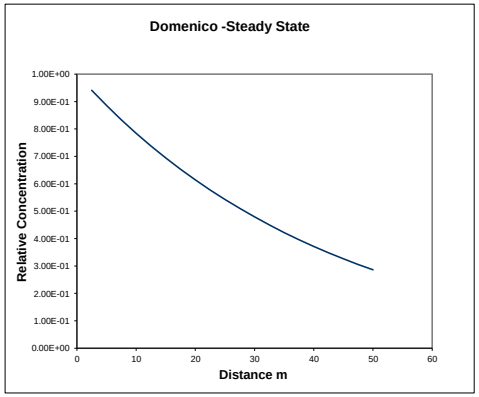
Calc **Value**

v	6.19E-01	m/d
Rc	9.97E+02	
u	6.21E-04	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.08E-02	9.41E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.25	-1.22E-01	8.85E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.25	-1.82E-01	8.33E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.25	-2.43E-01	7.84E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.25	-3.04E-01	7.38E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.25	-3.65E-01	6.94E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.25	-4.26E-01	6.53E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.25	-4.87E-01	6.15E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.25	-5.47E-01	5.78E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.25	-6.08E-01	5.44E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.25	-6.69E-01	5.12E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.25	-7.30E-01	4.82E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.25	-7.91E-01	4.54E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.25	-8.52E-01	4.27E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.25	-9.12E-01	4.02E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.25	-9.73E-01	3.78E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.25	-1.03E+00	3.56E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.25	-1.09E+00	3.35E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.25	-1.16E+00	3.15E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.25	-1.22E+00	2.96E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	2.86E-01



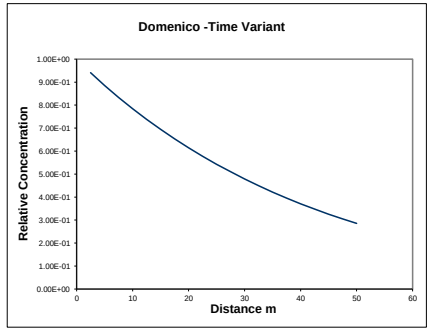
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Aro C12-C16	
Input	**Value**	**Units**
C_T	0.09	mg/l
DF	3.0774	
λ	1.696E-05	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.661E+01	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

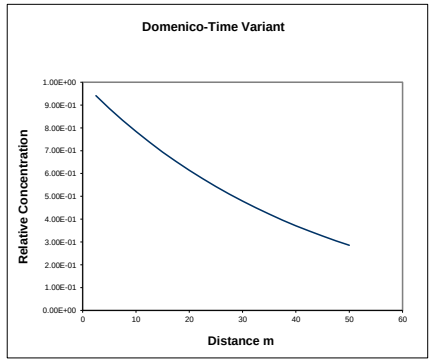
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-6.08E-02	9.41E-01	-2.19E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.41E-01
2	5	0.125	-1.22E-01	8.85E-01	-2.19E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	8.85E-01
3	7.5	0.125	-1.82E-01	8.33E-01	-2.19E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	8.33E-01
4	10	0.125	-2.43E-01	7.84E-01	-2.19E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	7.84E-01
5	12.5	0.125	-3.04E-01	7.38E-01	-2.19E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	7.38E-01
6	15	0.125	-3.65E-01	6.94E-01	-2.19E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	6.94E-01
7	17.5	0.125	-4.26E-01	6.53E-01	-2.19E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	6.53E-01
8	20	0.125	-4.87E-01	6.15E-01	-2.19E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	6.14E-01
9	22.5	0.125	-5.47E-01	5.78E-01	-2.19E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	5.78E-01
10	25	0.125	-6.08E-01	5.44E-01	-2.19E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	5.43E-01
11	27.5	0.125	-6.69E-01	5.12E-01	-2.19E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	5.10E-01
12	30	0.125	-7.30E-01	4.82E-01	-2.19E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	4.79E-01
13	32.5	0.125	-7.91E-01	4.54E-01	-2.19E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	4.50E-01
14	35	0.125	-8.52E-01	4.27E-01	-2.19E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	4.22E-01
15	37.5	0.125	-9.12E-01	4.02E-01	-2.19E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	3.96E-01
16	40	0.125	-9.73E-01	3.78E-01	-2.19E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	3.71E-01
17	42.5	0.125	-1.03E+00	3.56E-01	-2.19E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	3.48E-01
18	45	0.125	-1.09E+00	3.35E-01	-2.19E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	3.26E-01
19	47.5	0.125	-1.16E+00	3.15E-01	-2.19E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	3.05E-01
20	50	0.125	-1.22E+00	2.96E-01	-2.19E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	2.86E-01



Calc	Value	
v	6.19E-01	m/d
Rc	9.97E+02	
u	6.21E-04	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-6.08E-02	9.41E-01	-2.19E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.41E-01
2	5	0.125	-1.22E-01	8.85E-01	-2.19E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	8.85E-01
3	7.5	0.125	-1.82E-01	8.33E-01	-2.19E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	8.33E-01
4	10	0.125	-2.43E-01	7.84E-01	-2.19E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	7.84E-01
5	12.5	0.125	-3.04E-01	7.38E-01	-2.19E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	7.38E-01
6	15	0.125	-3.65E-01	6.94E-01	-2.19E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	6.94E-01
7	17.5	0.125	-4.26E-01	6.53E-01	-2.19E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	6.53E-01
8	20	0.125	-4.87E-01	6.15E-01	-2.19E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	6.14E-01
9	22.5	0.125	-5.47E-01	5.78E-01	-2.19E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	5.78E-01
10	25	0.125	-6.08E-01	5.44E-01	-2.19E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	5.43E-01
11	27.5	0.125	-6.69E-01	5.12E-01	-2.19E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	5.10E-01
12	30	0.125	-7.30E-01	4.82E-01	-2.19E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	4.79E-01
13	32.5	0.125	-7.91E-01	4.54E-01	-2.19E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	4.50E-01
14	35	0.125	-8.52E-01	4.27E-01	-2.19E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	4.22E-01
15	37.5	0.125	-9.12E-01	4.02E-01	-2.19E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	3.96E-01
16	40	0.125	-9.73E-01	3.78E-01	-2.19E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	3.71E-01
17	42.5	0.125	-1.03E+00	3.56E-01	-2.19E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	3.48E-01
18	45	0.125	-1.09E+00	3.35E-01	-2.19E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	3.26E-01
19	47.5	0.125	-1.16E+00	3.15E-01	-2.19E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	3.06E-01
20	50	0.125	-1.22E+00	2.96E-01	-2.19E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	2.86E-01



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

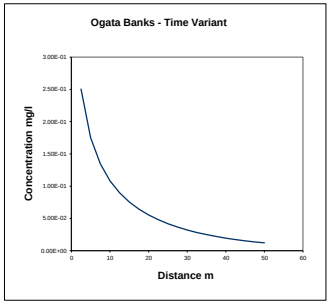
Contaminant	Aro C12-C16	
Input	**Value**	**Units**
C_T	0.09	mg/l
Co	4.00E-01	mg/l
λ	1.70E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.66E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	9.97E+02	
u	4.20E-04	m/d

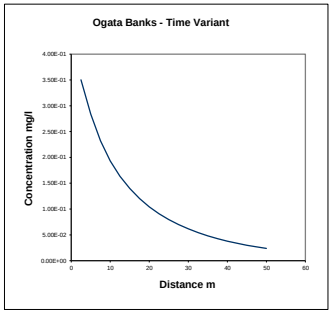
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.05	-8.6E-02	9.2E-01	-6.2E+47	2.000	5.9E-01	1.8E+00	6.2E+47	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.51E-01
2	5	0.05	-1.7E-01	8.4E-01	-6.2E+47	2.000	1.2E+00	3.2E+00	6.2E+47	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.75E-01
3	7.5	0.05	-2.6E-01	7.7E-01	-6.2E+47	2.000	1.8E+00	5.8E+00	6.2E+47	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.35E-01
4	10	0.05	-3.4E-01	7.1E-01	-6.2E+47	2.000	2.3E+00	1.0E+01	6.2E+47	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.08E-01
5	12.5	0.05	-4.3E-01	6.5E-01	-6.2E+47	2.000	2.9E+00	1.9E+01	6.2E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	8.97E-02
6	15	0.05	-5.2E-01	6.0E-01	-6.2E+47	2.000	3.5E+00	3.4E+01	6.2E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	7.56E-02
7	17.5	0.05	-6.0E-01	5.5E-01	-6.2E+47	2.000	4.1E+00	6.1E+01	6.2E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	6.44E-02
8	20	0.05	-6.9E-01	5.0E-01	-6.2E+47	2.000	4.7E+00	1.1E+02	6.2E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	5.54E-02
9	22.5	0.05	-7.8E-01	4.6E-01	-6.2E+47	2.000	5.3E+00	2.0E+02	6.2E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.80E-02
10	25	0.05	-8.6E-01	4.2E-01	-6.2E+47	2.000	5.9E+00	3.5E+02	6.2E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	4.18E-02
11	27.5	0.05	-9.5E-01	3.9E-01	-6.2E+47	2.000	6.4E+00	6.3E+02	6.2E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	3.66E-02
12	30	0.05	-1.0E+00	3.6E-01	-6.2E+47	2.000	7.0E+00	1.1E+03	6.2E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	3.21E-02
13	32.5	0.05	-1.1E+00	3.3E-01	-6.2E+47	2.000	7.6E+00	2.0E+03	6.2E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	2.83E-02
14	35	0.05	-1.2E+00	3.0E-01	-6.2E+47	2.000	8.2E+00	3.7E+03	6.2E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	2.49E-02
15	37.5	0.05	-1.3E+00	2.7E-01	-6.2E+47	2.000	8.8E+00	6.6E+03	6.2E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	2.20E-02
16	40	0.05	-1.4E+00	2.5E-01	-6.2E+47	2.000	9.4E+00	1.2E+04	6.2E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	1.95E-02
17	42.5	0.05	-1.5E+00	2.3E-01	-6.2E+47	2.000	1.0E+01	2.1E+04	6.2E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	1.73E-02
18	45	0.05	-1.6E+00	2.1E-01	-6.2E+47	2.000	1.1E+01	3.8E+04	6.2E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.54E-02
19	47.5	0.05	-1.6E+00	1.9E-01	-6.2E+47	2.000	1.1E+01	6.9E+04	6.2E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.37E-02
20	50	0.05	-1.7E+00	1.8E-01	-6.2E+47	2.000	1.2E+01	1.2E+05	6.2E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	1.22E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.05	-8.6E-02	9.2E-01	-6.2E+47	2.000	5.9E-01	1.8E+00	6.2E+47	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	3.50E-01
2	5	0.05	-1.7E-01	8.4E-01	-6.2E+47	2.000	1.2E+00	3.2E+00	6.2E+47	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	2.84E-01
3	7.5	0.05	-2.6E-01	7.7E-01	-6.2E+47	2.000	1.8E+00	5.8E+00	6.2E+47	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	2.32E-01
4	10	0.05	-3.4E-01	7.1E-01	-6.2E+47	2.000	2.3E+00	1.0E+01	6.2E+47	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.93E-01
5	12.5	0.05	-4.3E-01	6.5E-01	-6.2E+47	2.000	2.9E+00	1.9E+01	6.2E+47	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	1.63E-01
6	15	0.05	-5.2E-01	6.0E-01	-6.2E+47	2.000	3.5E+00	3.4E+01	6.2E+47	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	1.40E-01
7	17.5	0.05	-6.0E-01	5.5E-01	-6.2E+47	2.000	4.1E+00	6.1E+01	6.2E+47	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.20E-01
8	20	0.05	-6.9E-01	5.0E-01	-6.2E+47	2.000	4.7E+00	1.1E+02	6.2E+47	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.04E-01
9	22.5	0.05	-7.8E-01	4.6E-01	-6.2E+47	2.000	5.3E+00	2.0E+02	6.2E+47	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	9.10E-02
10	25	0.05	-8.6E-01	4.2E-01	-6.2E+47	2.000	5.9E+00	3.5E+02	6.2E+47	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.97E-02
11	27.5	0.05	-9.5E-01	3.9E-01	-6.2E+47	2.000	6.4E+00	6.3E+02	6.2E+47	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	7.00E-02
12	30	0.05	-1.0E+00	3.6E-01	-6.2E+47	2.000	7.0E+00	1.1E+03	6.2E+47	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	6.16E-02
13	32.5	0.05	-1.1E+00	3.3E-01	-6.2E+47	2.000	7.6E+00	2.0E+03	6.2E+47	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	5.44E-02
14	35	0.05	-1.2E+00	3.0E-01	-6.2E+47	2.000	8.2E+00	3.7E+03	6.2E+47	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	4.82E-02
15	37.5	0.05	-1.3E+00	2.7E-01	-6.2E+47	2.000	8.8E+00	6.6E+03	6.2E+47	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	4.27E-02
16	40	0.05	-1.4E+00	2.5E-01	-6.2E+47	2.000	9.4E+00	1.2E+04	6.2E+47	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	3.79E-02
17	42.5	0.05	-1.5E+00	2.3E-01	-6.2E+47	2.000	1.0E+01	2.1E+04	6.2E+47	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	3.37E-02
18	45	0.05	-1.6E+00	2.1E-01	-6.2E+47	2.000	1.1E+01	3.8E+04	6.2E+47	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.00E-02
19	47.5	0.05	-1.6E+00	1.9E-01	-6.2E+47	2.000	1.1E+01	6.9E+04	6.2E+47	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	2.67E-02
20	50	0.05	-1.7E+00	1.8E-01	-6.2E+47	2.000	1.2E+01	1.2E+05	6.2E+47	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	2.38E-02



Date:	13.07.2021
Version:	1

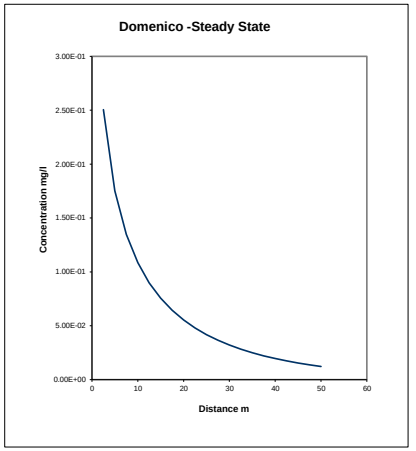
DOMENICO (STEADY STATE)

Contaminant **Aro C12-C16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.09	mg/l
Co	4.00E-01	mg/l
λ	1.70E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.66E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.1	-8.62E-02	9.17E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.51E-01
2	5	0.1	-1.72E-01	8.42E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.75E-01
3	7.5	0.1	-2.59E-01	7.72E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.35E-01
4	10	0.1	-3.45E-01	7.08E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.08E-01
5	12.5	0.1	-4.31E-01	6.50E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	8.97E-02
6	15	0.1	-5.17E-01	5.96E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	7.56E-02
7	17.5	0.1	-6.03E-01	5.47E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	6.44E-02
8	20	0.1	-6.90E-01	5.02E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	5.54E-02
9	22.5	0.1	-7.76E-01	4.60E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.80E-02
10	25	0.1	-8.62E-01	4.22E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	4.18E-02
11	27.5	0.1	-9.48E-01	3.87E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	3.66E-02
12	30	0.1	-1.03E+00	3.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	3.21E-02
13	32.5	0.1	-1.12E+00	3.26E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	2.83E-02
14	35	0.1	-1.21E+00	2.99E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	2.49E-02
15	37.5	0.1	-1.29E+00	2.74E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	2.20E-02
16	40	0.1	-1.38E+00	2.52E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	1.95E-02
17	42.5	0.1	-1.47E+00	2.31E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	1.73E-02
18	45	0.1	-1.55E+00	2.12E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.54E-02
19	47.5	0.1	-1.64E+00	1.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.37E-02
20	50	0.1	-1.72E+00	1.78E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	1.22E-02



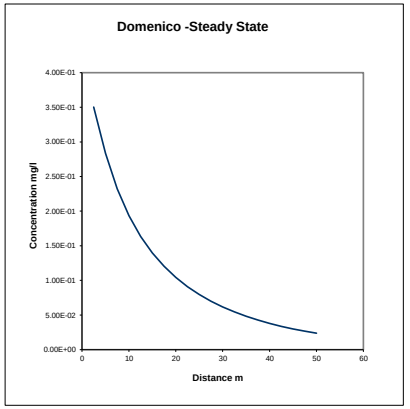
Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	9.97E+02	
u	4.20E-04	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.1	-8.62E-02	9.17E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	3.50E-01
2	5	0.1	-1.72E-01	8.42E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	2.84E-01
3	7.5	0.1	-2.59E-01	7.72E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	2.32E-01
4	10	0.1	-3.45E-01	7.08E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.93E-01
5	12.5	0.1	-4.31E-01	6.50E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	1.63E-01
6	15	0.1	-5.17E-01	5.96E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	1.40E-01
7	17.5	0.1	-6.03E-01	5.47E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.20E-01
8	20	0.1	-6.90E-01	5.02E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.04E-01
9	22.5	0.1	-7.76E-01	4.60E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	9.10E-02
10	25	0.1	-8.62E-01	4.22E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.97E-02
11	27.5	0.1	-9.48E-01	3.87E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	7.00E-02
12	30	0.1	-1.03E+00	3.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	6.16E-02
13	32.5	0.1	-1.12E+00	3.26E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	5.44E-02
14	35	0.1	-1.21E+00	2.99E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	4.82E-02
15	37.5	0.1	-1.29E+00	2.74E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	4.27E-02
16	40	0.1	-1.38E+00	2.52E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	3.79E-02
17	42.5	0.1	-1.47E+00	2.31E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	3.37E-02
18	45	0.1	-1.55E+00	2.12E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.00E-02
19	47.5	0.1	-1.64E+00	1.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	2.67E-02
20	50	0.1	-1.72E+00	1.78E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	2.38E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

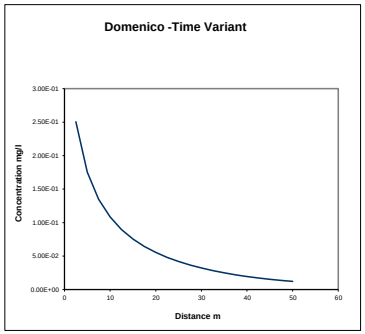
Contaminant **Aro C12-C16**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.09	mg/l
Co	4.00E-01	mg/l
λ	1.70E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.66E+01	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

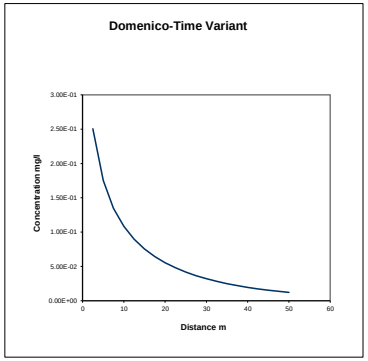
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.05	-8.62E-02	9.17E-01	-6.16E+47	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.51E-01
2	5	0.05	-1.72E-01	8.42E-01	-6.16E+47	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.75E-01
3	7.5	0.05	-2.59E-01	7.72E-01	-6.16E+47	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.35E-01
4	10	0.05	-3.45E-01	7.08E-01	-6.16E+47	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.08E-01
5	12.5	0.05	-4.31E-01	6.50E-01	-6.16E+47	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	8.97E-02
6	15	0.05	-5.17E-01	5.96E-01	-6.16E+47	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	7.56E-02
7	17.5	0.05	-6.03E-01	5.47E-01	-6.16E+47	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	6.44E-02
8	20	0.05	-6.90E-01	5.02E-01	-6.16E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	5.54E-02
9	22.5	0.05	-7.76E-01	4.60E-01	-6.16E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.80E-02
10	25	0.05	-8.62E-01	4.22E-01	-6.16E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	4.18E-02
11	27.5	0.05	-9.48E-01	3.87E-01	-6.16E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	3.66E-02
12	30	0.05	-1.03E+00	3.55E-01	-6.16E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	3.21E-02
13	32.5	0.05	-1.12E+00	3.26E-01	-6.16E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	2.83E-02
14	35	0.05	-1.21E+00	2.99E-01	-6.16E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	2.49E-02
15	37.5	0.05	-1.29E+00	2.74E-01	-6.16E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	2.20E-02
16	40	0.05	-1.38E+00	2.52E-01	-6.16E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	1.95E-02
17	42.5	0.05	-1.47E+00	2.31E-01	-6.16E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	1.73E-02
18	45	0.05	-1.55E+00	2.12E-01	-6.16E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.54E-02
19	47.5	0.05	-1.64E+00	1.94E-01	-6.16E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.37E-02
20	50	0.05	-1.72E+00	1.78E-01	-6.16E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	1.22E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

Calc	Value	Units
v	4.18E-01	m/d
Rc	9.97E+02	
u	4.20E-04	m/d

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.05	-8.62E-02	9.17E-01	-6.16E+47	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	3.50E-01
2	5	0.05	-1.72E-01	8.42E-01	-6.16E+47	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	2.84E-01
3	7.5	0.05	-2.59E-01	7.72E-01	-6.16E+47	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	2.32E-01
4	10	0.05	-3.45E-01	7.08E-01	-6.16E+47	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.93E-01
5	12.5	0.05	-4.31E-01	6.50E-01	-6.16E+47	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	1.63E-01
6	15	0.05	-5.17E-01	5.96E-01	-6.16E+47	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	1.40E-01
7	17.5	0.05	-6.03E-01	5.47E-01	-6.16E+47	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.20E-01
8	20	0.05	-6.90E-01	5.02E-01	-6.16E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.04E-01
9	22.5	0.05	-7.76E-01	4.60E-01	-6.16E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	9.10E-02
10	25	0.05	-8.62E-01	4.22E-01	-6.16E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.97E-02
11	27.5	0.05	-9.48E-01	3.87E-01	-6.16E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	7.00E-02
12	30	0.05	-1.03E+00	3.55E-01	-6.16E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	6.16E-02
13	32.5	0.05	-1.12E+00	3.26E-01	-6.16E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	5.44E-02
14	35	0.05	-1.21E+00	2.99E-01	-6.16E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	4.82E-02
15	37.5	0.05	-1.29E+00	2.74E-01	-6.16E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	4.27E-02
16	40	0.05	-1.38E+00	2.52E-01	-6.16E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	3.79E-02
17	42.5	0.05	-1.47E+00	2.31E-01	-6.16E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	3.37E-02
18	45	0.05	-1.55E+00	2.12E-01	-6.16E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.00E-02
19	47.5	0.05	-1.64E+00	1.94E-01	-6.16E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	2.67E-02
20	50	0.05	-1.72E+00	1.78E-01	-6.16E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	2.38E-02



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment

Site Name:	**Tetrosyl**			
Site Address:	**Becis Green Bury**			
Completed by:	**BJT**			
Date:	**13.07.2021**		**Version:**	**1**
Contaminant	**Benzene**			
Target Concentration (C_T)	**0.01**	**mg/l**	**Origin of C_T:**	**R2174C-R09 - Tier 1 Criteria**

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzene**		
Target concentration	C_T	**0.01**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.16E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	1.35E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.25E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.39E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.01	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzene**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.01** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**3.08E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.28E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Benzene		from Level 1
Target Concentration	C_T	0.01	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		0.4	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	7.70E+01	days	R2174c-R10-App A
Calculated decay rate	λ	9.00E-03	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	9.00E-03	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.89E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.04E+00**	**fraction**
Calculated soil leachate concentration	Co	2.88E-01	mg/l

Remedial Targets

Level 3 Remedial Target	**6.29E-02**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	8.75E-02	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**4.89E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient Kd 0.00E+00 l/kg

Define dispersivity (click brown cell and use pull down list)

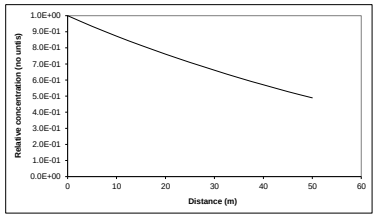
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	9.35E-02
2.5	9.67E-01	9.03E-02
5.0	9.34E-01	8.73E-02
7.5	9.03E-01	8.44E-02
10.0	8.73E-01	8.16E-02
12.5	8.44E-01	7.88E-02
15.0	8.15E-01	7.62E-02
17.5	7.88E-01	7.36E-02
20.0	7.61E-01	7.11E-02
22.5	7.35E-01	6.87E-02
25.0	7.10E-01	6.63E-02
27.5	6.85E-01	6.40E-02
30.0	6.61E-01	6.18E-02
32.5	6.37E-01	5.95E-02
35.0	6.14E-01	5.74E-02
37.5	5.92E-01	5.53E-02
40.0	5.70E-01	5.33E-02
42.5	5.49E-01	5.13E-02
45.0	5.28E-01	4.94E-02
47.5	5.09E-01	4.75E-02
50.0	4.89E-01	4.57E-02

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

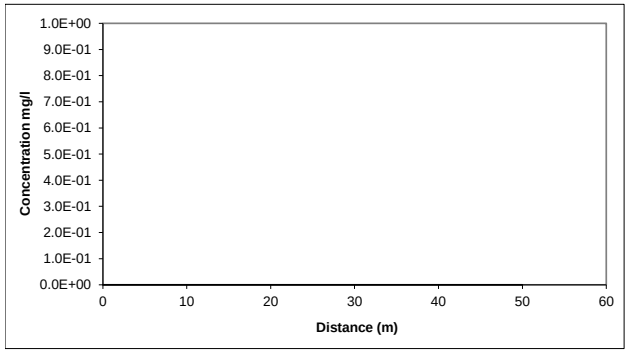
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.16E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.25E+00	l/kg
Factor (partitioning between soil and water)		1.39E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.04E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu) | **Variable** | **Value** | **Unit** | **Source**

Contaminant		Benzene		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	5.00E-01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	7.70E+01	days	R2174c-R10-App A
Calculated decay rate	λ	9.00E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.25E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters | **Variable**

Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	2.78E+01	fraction
Decay rate used	λ	3.24E-04	d^{-1}
Rate of contaminant flow due to retardation	u	1.50E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	6.26E-02	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**7.99E+00**	

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	1.35E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.25E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

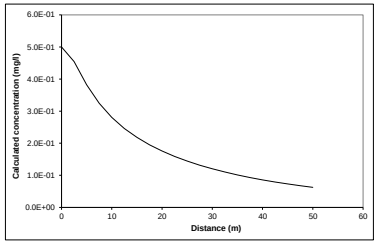
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	5.0E-01
2.5	4.54E-01
5.0	3.82E-01
7.5	3.24E-01
10.0	2.81E-01
12.5	2.46E-01
15.0	2.18E-01
17.5	1.95E-01
20.0	1.76E-01
22.5	1.59E-01
25.0	1.44E-01
27.5	1.32E-01
30.0	1.20E-01
32.5	1.10E-01
35.0	1.01E-01
37.5	9.32E-02
40.0	8.59E-02
42.5	7.92E-02
45.0	7.31E-02
47.5	6.76E-02
50.0	6.26E-02

Remedial Targets

Remedial Target		**7.99E-02**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**6.26E-02**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Benzene**

Parameter	Value	Units
(carried over from input sheet)		
C_T	1.00E-02	mg/l
Kd	1.25E+00	l/kg
foc	9.30E-03	fraction
koc	1.35E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.16E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			1.25E+00	l/kg

Calculated Remedial Target	**1.39E-02**	**mg/kg**	**for**	**Benzene**

Factor (partitioning between soil and water) 1.39E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Benzene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

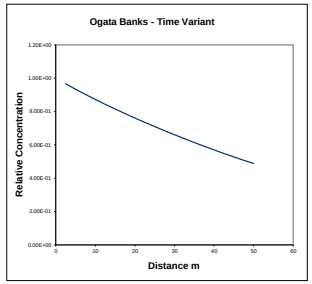
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	1.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Benzene	
Input	**Value**	**Units**
C_T	1.000E-02	mg/l
DF	3.077E+00	
λ	9.002E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

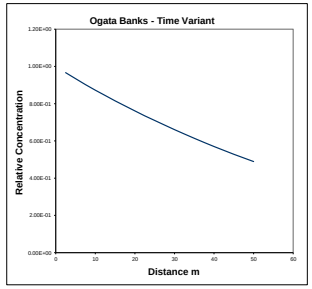
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-3.40E-02	9.67E-01	-6.32E+48	2	5.34E-01	1.71E+00	6.32E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.67E-01
2	5	0.13	-6.80E-02	9.34E-01	-6.32E+48	2	1.07E+00	2.91E+00	6.32E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.34E-01
3	7.5	0.13	-1.02E-01	9.03E-01	-6.32E+48	2	1.60E+00	4.96E+00	6.32E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.03E-01
4	10	0.13	-1.36E-01	8.73E-01	-6.32E+48	2	2.14E+00	8.47E+00	6.32E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.73E-01
5	12.5	0.13	-1.70E-01	8.44E-01	-6.32E+48	2	2.67E+00	1.44E+01	6.32E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	8.44E-01
6	15	0.13	-2.04E-01	8.15E-01	-6.32E+48	2	3.20E+00	2.46E+01	6.32E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	8.15E-01
7	17.5	0.13	-2.38E-01	7.88E-01	-6.32E+48	2	3.74E+00	4.20E+01	6.32E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	7.88E-01
8	20	0.13	-2.72E-01	7.62E-01	-6.32E+48	2	4.27E+00	7.17E+01	6.32E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	7.61E-01
9	22.5	0.13	-3.06E-01	7.36E-01	-6.32E+48	2	4.81E+00	1.22E+02	6.32E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	7.35E-01
10	25	0.13	-3.40E-01	7.12E-01	-6.32E+48	2	5.34E+00	2.09E+02	6.32E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	7.10E-01
11	27.5	0.13	-3.74E-01	6.88E-01	-6.32E+48	2	5.87E+00	3.56E+02	6.32E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	6.85E-01
12	30	0.13	-4.08E-01	6.65E-01	-6.32E+48	2	6.41E+00	6.07E+02	6.32E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	6.61E-01
13	32.5	0.13	-4.42E-01	6.43E-01	-6.32E+48	2	6.94E+00	1.04E+03	6.32E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	6.37E-01
14	35	0.13	-4.76E-01	6.21E-01	-6.32E+48	2	7.48E+00	1.77E+03	6.32E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	6.14E-01
15	37.5	0.13	-5.10E-01	6.00E-01	-6.32E+48	2	8.01E+00	3.01E+03	6.32E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	5.92E-01
16	40	0.13	-5.44E-01	5.80E-01	-6.32E+48	2	8.54E+00	5.14E+03	6.32E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	5.70E-01
17	42.5	0.13	-5.78E-01	5.61E-01	-6.32E+48	2	9.08E+00	8.76E+03	6.32E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	5.49E-01
18	45	0.13	-6.12E-01	5.42E-01	-6.32E+48	2	9.61E+00	1.49E+04	6.32E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	5.28E-01
19	47.5	0.13	-6.46E-01	5.24E-01	-6.32E+48	2	1.01E+01	2.55E+04	6.32E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.08E-01
20	50	0.13	-6.80E-01	5.06E-01	-6.32E+48	2	1.07E+01	4.35E+04	6.32E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.88E-01



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-3.40E-02	9.67E-01	-6.32E+48	2	5.34E-01	1.71E+00	6.32E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.13	-6.80E-02	9.34E-01	-6.32E+48	2	1.07E+00	2.91E+00	6.32E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.13	-1.02E-01	9.03E-01	-6.32E+48	2	1.60E+00	4.96E+00	6.32E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.13	-1.36E-01	8.73E-01	-6.32E+48	2	2.14E+00	8.47E+00	6.32E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.13	-1.70E-01	8.44E-01	-6.32E+48	2	2.67E+00	1.44E+01	6.32E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.13	-2.04E-01	8.15E-01	-6.32E+48	2	3.20E+00	2.46E+01	6.32E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.13	-2.38E-01	7.88E-01	-6.32E+48	2	3.74E+00	4.20E+01	6.32E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.13	-2.72E-01	7.62E-01	-6.32E+48	2	4.27E+00	7.17E+01	6.32E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.13	-3.06E-01	7.36E-01	-6.32E+48	2	4.81E+00	1.22E+02	6.32E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.13	-3.40E-01	7.12E-01	-6.32E+48	2	5.34E+00	2.09E+02	6.32E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.13	-3.74E-01	6.88E-01	-6.32E+48	2	5.87E+00	3.56E+02	6.32E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.13	-4.08E-01	6.65E-01	-6.32E+48	2	6.41E+00	6.07E+02	6.32E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.13	-4.42E-01	6.43E-01	-6.32E+48	2	6.94E+00	1.04E+03	6.32E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.13	-4.76E-01	6.21E-01	-6.32E+48	2	7.48E+00	1.77E+03	6.32E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.13	-5.10E-01	6.00E-01	-6.32E+48	2	8.01E+00	3.01E+03	6.32E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.13	-5.44E-01	5.80E-01	-6.32E+48	2	8.54E+00	5.14E+03	6.32E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.13	-5.78E-01	5.61E-01	-6.32E+48	2	9.08E+00	8.76E+03	6.32E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.13	-6.12E-01	5.42E-01	-6.32E+48	2	9.61E+00	1.49E+04	6.32E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.13	-6.46E-01	5.24E-01	-6.32E+48	2	1.01E+01	2.55E+04	6.32E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.13	-6.80E-01	5.06E-01	-6.32E+48	2	1.07E+01	4.35E+04	6.32E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.89E-01



Date:	13.07.2021
Version:	1

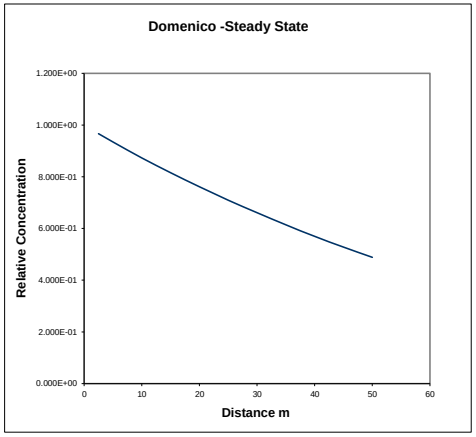
Contaminant **Benzene**

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	1.000E-02	mg/l
DF	3.077E+00	
λ	9.002E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-3.40E-02	9.67E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.666E-01
2	5	0.25	-6.80E-02	9.34E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.342E-01
3	7.5	0.25	-1.02E-01	9.03E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.030E-01
4	10	0.25	-1.36E-01	8.73E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.728E-01
5	12.5	0.25	-1.70E-01	8.44E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	8.436E-01
6	15	0.25	-2.04E-01	8.15E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	8.153E-01
7	17.5	0.25	-2.38E-01	7.88E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	7.879E-01
8	20	0.25	-2.72E-01	7.62E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	7.612E-01
9	22.5	0.25	-3.06E-01	7.36E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	7.351E-01
10	25	0.25	-3.40E-01	7.12E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	7.097E-01
11	27.5	0.25	-3.74E-01	6.88E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	6.849E-01
12	30	0.25	-4.08E-01	6.65E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	6.607E-01
13	32.5	0.25	-4.42E-01	6.43E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	6.371E-01
14	35	0.25	-4.76E-01	6.21E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	6.140E-01
15	37.5	0.25	-5.10E-01	6.00E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	5.916E-01
16	40	0.25	-5.44E-01	5.80E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	5.697E-01
17	42.5	0.25	-5.78E-01	5.61E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	5.485E-01
18	45	0.25	-6.12E-01	5.42E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	5.279E-01
19	47.5	0.25	-6.46E-01	5.24E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.079E-01
20	50	0.25	-6.80E-01	5.06E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.884E-01



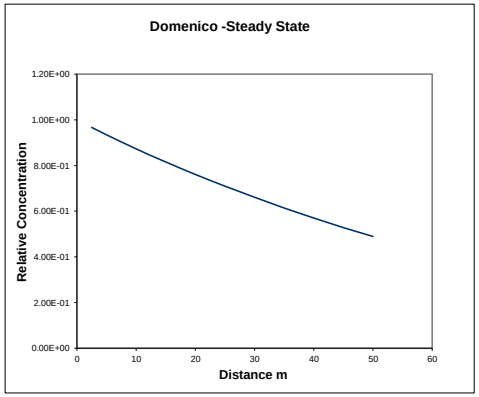
Calc **Value**

v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-3.40E-02	9.67E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.25	-6.80E-02	9.34E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.25	-1.02E-01	9.03E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.25	-1.36E-01	8.73E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.25	-1.70E-01	8.44E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.25	-2.04E-01	8.15E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.25	-2.38E-01	7.88E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.25	-2.72E-01	7.62E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.25	-3.06E-01	7.36E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.25	-3.40E-01	7.12E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.25	-3.74E-01	6.88E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.25	-4.08E-01	6.65E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.25	-4.42E-01	6.43E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.25	-4.76E-01	6.21E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.25	-5.10E-01	6.00E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.25	-5.44E-01	5.80E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.25	-5.78E-01	5.61E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.25	-6.12E-01	5.42E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.25	-6.46E-01	5.24E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.25	-6.80E-01	5.06E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.89E-01



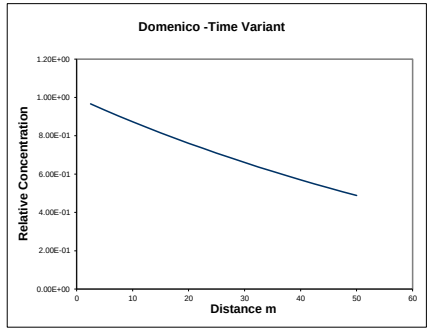
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Benzene	
Input	**Value**	**Units**
C_T	0.01	mg/l
DF	3.0774	
λ	9.002E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

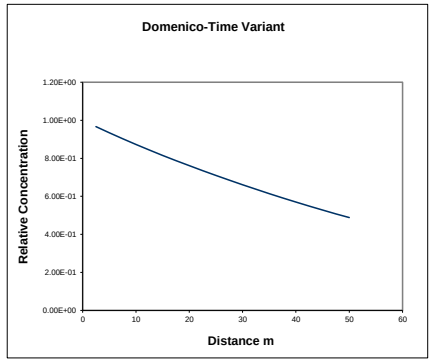
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-3.40E-02	9.67E-01	-6.32E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.67E-01
2	5	0.125	-6.80E-02	9.34E-01	-6.32E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.34E-01
3	7.5	0.125	-1.02E-01	9.03E-01	-6.32E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.03E-01
4	10	0.125	-1.36E-01	8.73E-01	-6.32E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.73E-01
5	12.5	0.125	-1.70E-01	8.44E-01	-6.32E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	8.44E-01
6	15	0.125	-2.04E-01	8.15E-01	-6.32E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	8.15E-01
7	17.5	0.125	-2.38E-01	7.88E-01	-6.32E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	7.88E-01
8	20	0.125	-2.72E-01	7.62E-01	-6.32E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	7.61E-01
9	22.5	0.125	-3.06E-01	7.36E-01	-6.32E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	7.35E-01
10	25	0.125	-3.40E-01	7.12E-01	-6.32E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	7.10E-01
11	27.5	0.125	-3.74E-01	6.88E-01	-6.32E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	6.85E-01
12	30	0.125	-4.08E-01	6.65E-01	-6.32E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	6.61E-01
13	32.5	0.125	-4.42E-01	6.43E-01	-6.32E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	6.37E-01
14	35	0.125	-4.76E-01	6.21E-01	-6.32E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	6.14E-01
15	37.5	0.125	-5.10E-01	6.00E-01	-6.32E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	5.92E-01
16	40	0.125	-5.44E-01	5.80E-01	-6.32E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	5.70E-01
17	42.5	0.125	-5.78E-01	5.61E-01	-6.32E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	5.49E-01
18	45	0.125	-6.12E-01	5.42E-01	-6.32E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	5.28E-01
19	47.5	0.125	-6.46E-01	5.24E-01	-6.32E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.08E-01
20	50	0.125	-6.80E-01	5.06E-01	-6.32E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.88E-01



Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-3.40E-02	9.67E-01	-6.32E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.67E-01
2	5	0.125	-6.80E-02	9.34E-01	-6.32E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.34E-01
3	7.5	0.125	-1.02E-01	9.03E-01	-6.32E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.03E-01
4	10	0.125	-1.36E-01	8.73E-01	-6.32E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.73E-01
5	12.5	0.125	-1.70E-01	8.44E-01	-6.32E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	8.44E-01
6	15	0.125	-2.04E-01	8.15E-01	-6.32E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	8.15E-01
7	17.5	0.125	-2.38E-01	7.88E-01	-6.32E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	7.88E-01
8	20	0.125	-2.72E-01	7.62E-01	-6.32E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	7.61E-01
9	22.5	0.125	-3.06E-01	7.36E-01	-6.32E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	7.35E-01
10	25	0.125	-3.40E-01	7.12E-01	-6.32E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	7.10E-01
11	27.5	0.125	-3.74E-01	6.88E-01	-6.32E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	6.85E-01
12	30	0.125	-4.08E-01	6.65E-01	-6.32E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	6.61E-01
13	32.5	0.125	-4.42E-01	6.43E-01	-6.32E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	6.37E-01
14	35	0.125	-4.76E-01	6.21E-01	-6.32E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	6.14E-01
15	37.5	0.125	-5.10E-01	6.00E-01	-6.32E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	5.92E-01
16	40	0.125	-5.44E-01	5.80E-01	-6.32E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	5.70E-01
17	42.5	0.125	-5.78E-01	5.61E-01	-6.32E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	5.49E-01
18	45	0.125	-6.12E-01	5.42E-01	-6.32E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	5.28E-01
19	47.5	0.125	-6.46E-01	5.24E-01	-6.32E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.09E-01
20	50	0.125	-6.80E-01	5.06E-01	-6.32E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.89E-01



Date:	13.07.2021
Version:	1

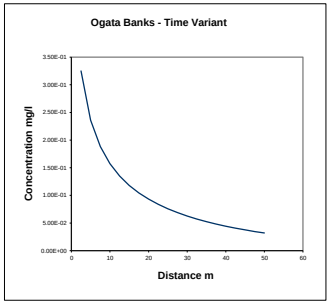
OGATA BANKS SOLUTION

Contaminant	Benzene	
Input	**Value**	**Units**
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

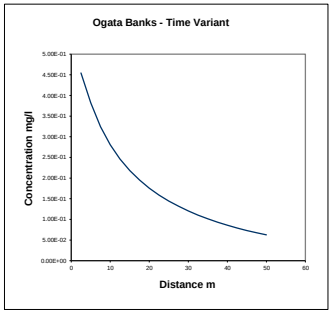
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.0625	-4.9E-02	9.5E-01	-3.3E+48	2.000	5.5E-01	1.7E+00	3.3E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	3.25E-01
2	5	0.0625	-9.8E-02	9.1E-01	-3.3E+48	2.000	1.1E+00	3.0E+00	3.3E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	2.36E-01
3	7.5	0.0625	-1.5E-01	8.6E-01	-3.3E+48	2.000	1.6E+00	5.2E+00	3.3E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.88E-01
4	10	0.0625	-2.0E-01	8.2E-01	-3.3E+48	2.000	2.2E+00	9.0E+00	3.3E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.57E-01
5	12.5	0.0625	-2.5E-01	7.8E-01	-3.3E+48	2.000	2.7E+00	1.6E+01	3.3E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.35E-01
6	15	0.0625	-2.9E-01	7.5E-01	-3.3E+48	2.000	3.3E+00	2.7E+01	3.3E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.18E-01
7	17.5	0.0625	-3.4E-01	7.1E-01	-3.3E+48	2.000	3.8E+00	4.7E+01	3.3E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.04E-01
8	20	0.0625	-3.9E-01	6.8E-01	-3.3E+48	2.000	4.4E+00	8.1E+01	3.3E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	9.33E-02
9	22.5	0.0625	-4.4E-01	6.4E-01	-3.3E+48	2.000	4.9E+00	1.4E+02	3.3E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	8.39E-02
10	25	0.0625	-4.9E-01	6.1E-01	-3.3E+48	2.000	5.5E+00	2.4E+02	3.3E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	7.58E-02
11	27.5	0.0625	-5.4E-01	5.8E-01	-3.3E+48	2.000	6.0E+00	4.2E+02	3.3E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	6.88E-02
12	30	0.0625	-5.9E-01	5.6E-01	-3.3E+48	2.000	6.6E+00	7.3E+02	3.3E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	6.27E-02
13	32.5	0.0625	-6.4E-01	5.3E-01	-3.3E+48	2.000	7.1E+00	1.3E+03	3.3E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	5.73E-02
14	35	0.0625	-6.9E-01	5.0E-01	-3.3E+48	2.000	7.7E+00	2.2E+03	3.3E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	5.25E-02
15	37.5	0.0625	-7.4E-01	4.8E-01	-3.3E+48	2.000	8.2E+00	3.8E+03	3.3E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	4.81E-02
16	40	0.0625	-7.8E-01	4.6E-01	-3.3E+48	2.000	8.8E+00	6.5E+03	3.3E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	4.43E-02
17	42.5	0.0625	-8.3E-01	4.3E-01	-3.3E+48	2.000	9.3E+00	1.1E+04	3.3E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	4.08E-02
18	45	0.0625	-8.8E-01	4.1E-01	-3.3E+48	2.000	9.9E+00	2.0E+04	3.3E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	3.76E-02
19	47.5	0.0625	-9.3E-01	3.9E-01	-3.3E+48	2.000	1.0E+01	3.4E+04	3.3E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.47E-02
20	50	0.0625	-9.8E-01	3.8E-01	-3.3E+48	2.000	1.1E+01	5.9E+04	3.3E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.21E-02



Calc	Value	
v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	0.0625	-4.9E-02	9.5E-01	-3.3E+48	2.000	5.5E-01	1.7E+00	3.3E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	4.54E-01
2	5	0.0625	-9.8E-02	9.1E-01	-3.3E+48	2.000	1.1E+00	3.0E+00	3.3E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	3.82E-01
3	7.5	0.0625	-1.5E-01	8.6E-01	-3.3E+48	2.000	1.6E+00	5.2E+00	3.3E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	3.24E-01
4	10	0.0625	-2.0E-01	8.2E-01	-3.3E+48	2.000	2.2E+00	9.0E+00	3.3E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.81E-01
5	12.5	0.0625	-2.5E-01	7.8E-01	-3.3E+48	2.000	2.7E+00	1.6E+01	3.3E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.46E-01
6	15	0.0625	-2.9E-01	7.5E-01	-3.3E+48	2.000	3.3E+00	2.7E+01	3.3E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.18E-01
7	17.5	0.0625	-3.4E-01	7.1E-01	-3.3E+48	2.000	3.8E+00	4.7E+01	3.3E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.95E-01
8	20	0.0625	-3.9E-01	6.8E-01	-3.3E+48	2.000	4.4E+00	8.1E+01	3.3E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.76E-01
9	22.5	0.0625	-4.4E-01	6.4E-01	-3.3E+48	2.000	4.9E+00	1.4E+02	3.3E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.59E-01
10	25	0.0625	-4.9E-01	6.1E-01	-3.3E+48	2.000	5.5E+00	2.4E+02	3.3E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	1.44E-01
11	27.5	0.0625	-5.4E-01	5.8E-01	-3.3E+48	2.000	6.0E+00	4.2E+02	3.3E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.32E-01
12	30	0.0625	-5.9E-01	5.6E-01	-3.3E+48	2.000	6.6E+00	7.3E+02	3.3E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.20E-01
13	32.5	0.0625	-6.4E-01	5.3E-01	-3.3E+48	2.000	7.1E+00	1.3E+03	3.3E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.10E-01
14	35	0.0625	-6.9E-01	5.0E-01	-3.3E+48	2.000	7.7E+00	2.2E+03	3.3E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	1.01E-01
15	37.5	0.0625	-7.4E-01	4.8E-01	-3.3E+48	2.000	8.2E+00	3.8E+03	3.3E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	9.32E-02
16	40	0.0625	-7.8E-01	4.6E-01	-3.3E+48	2.000	8.8E+00	6.5E+03	3.3E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	8.59E-02
17	42.5	0.0625	-8.3E-01	4.3E-01	-3.3E+48	2.000	9.3E+00	1.1E+04	3.3E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	7.92E-02
18	45	0.0625	-8.8E-01	4.1E-01	-3.3E+48	2.000	9.9E+00	2.0E+04	3.3E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	7.31E-02
19	47.5	0.0625	-9.3E-01	3.9E-01	-3.3E+48	2.000	1.0E+01	3.4E+04	3.3E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.76E-02
20	50	0.0625	-9.8E-01	3.8E-01	-3.3E+48	2.000	1.1E+01	5.9E+04	3.3E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	6.26E-02



Date:	13.07.2021
Version:	1

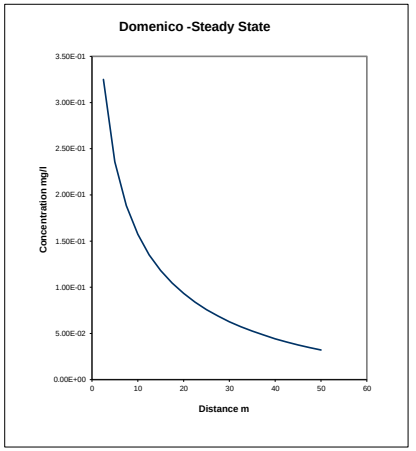
DOMENICO (STEADY STATE)

Contaminant	Benzene	
Input	**Value**	**Units**
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.125	-4.90E-02	9.52E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	3.25E-01
2	5	0.125	-9.80E-02	9.07E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	2.36E-01
3	7.5	0.125	-1.47E-01	8.63E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.88E-01
4	10	0.125	-1.96E-01	8.22E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.57E-01
5	12.5	0.125	-2.45E-01	7.83E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.35E-01
6	15	0.125	-2.94E-01	7.45E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.18E-01
7	17.5	0.125	-3.43E-01	7.10E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.04E-01
8	20	0.125	-3.92E-01	6.76E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	9.33E-02
9	22.5	0.125	-4.41E-01	6.43E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	8.39E-02
10	25	0.125	-4.90E-01	6.13E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	7.58E-02
11	27.5	0.125	-5.39E-01	5.83E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	6.88E-02
12	30	0.125	-5.88E-01	5.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	6.27E-02
13	32.5	0.125	-6.37E-01	5.29E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	5.73E-02
14	35	0.125	-6.86E-01	5.03E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	5.25E-02
15	37.5	0.125	-7.35E-01	4.79E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	4.81E-02
16	40	0.125	-7.84E-01	4.56E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	4.43E-02
17	42.5	0.125	-8.33E-01	4.35E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	4.08E-02
18	45	0.125	-8.82E-01	4.14E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	3.76E-02
19	47.5	0.125	-9.31E-01	3.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.47E-02
20	50	0.125	-9.80E-01	3.75E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.21E-02

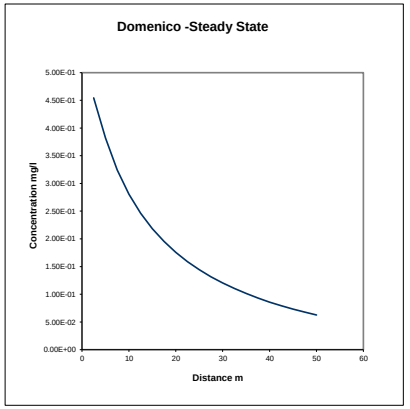


DOMENICO (STEADY STATE)

Calc	Value	
v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	0.125	-4.90E-02	9.52E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	4.54E-01
2	5	0.125	-9.80E-02	9.07E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	3.82E-01
3	7.5	0.125	-1.47E-01	8.63E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	3.24E-01
4	10	0.125	-1.96E-01	8.22E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.81E-01
5	12.5	0.125	-2.45E-01	7.83E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.46E-01
6	15	0.125	-2.94E-01	7.45E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.18E-01
7	17.5	0.125	-3.43E-01	7.10E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.95E-01
8	20	0.125	-3.92E-01	6.76E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.76E-01
9	22.5	0.125	-4.41E-01	6.43E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.59E-01
10	25	0.125	-4.90E-01	6.13E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	1.44E-01
11	27.5	0.125	-5.39E-01	5.83E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.32E-01
12	30	0.125	-5.88E-01	5.55E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.20E-01
13	32.5	0.125	-6.37E-01	5.29E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.10E-01
14	35	0.125	-6.86E-01	5.03E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	1.01E-01
15	37.5	0.125	-7.35E-01	4.79E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	9.32E-02
16	40	0.125	-7.84E-01	4.56E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	8.59E-02
17	42.5	0.125	-8.33E-01	4.35E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	7.92E-02
18	45	0.125	-8.82E-01	4.14E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	7.31E-02
19	47.5	0.125	-9.31E-01	3.94E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.76E-02
20	50	0.125	-9.80E-01	3.75E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	6.26E-02



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

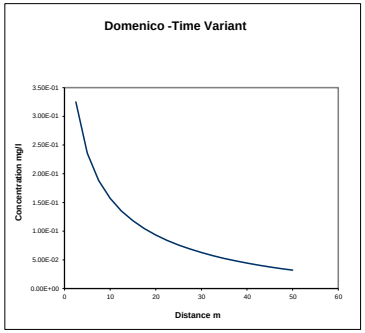
Contaminant	Benzene	
Input	**Value**	**Units**
C_T	0.01	mg/l
Co	5.00E-01	mg/l
λ	3.24E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.25E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	2.78E+01	
u	1.50E-02	m/d

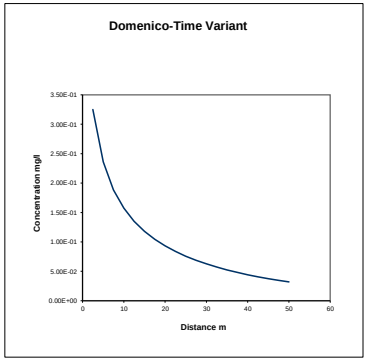
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.0625	-4.90E-02	9.52E-01	-3.28E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	3.25E-01
2	5	0.0625	-9.80E-02	9.07E-01	-3.28E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	2.36E-01
3	7.5	0.0625	-1.47E-01	8.63E-01	-3.28E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.88E-01
4	10	0.0625	-1.96E-01	8.22E-01	-3.28E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.57E-01
5	12.5	0.0625	-2.45E-01	7.83E-01	-3.28E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.35E-01
6	15	0.0625	-2.94E-01	7.45E-01	-3.28E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.18E-01
7	17.5	0.0625	-3.43E-01	7.10E-01	-3.28E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.04E-01
8	20	0.0625	-3.92E-01	6.76E-01	-3.28E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	9.33E-02
9	22.5	0.0625	-4.41E-01	6.43E-01	-3.28E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	8.39E-02
10	25	0.0625	-4.90E-01	6.13E-01	-3.28E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	7.58E-02
11	27.5	0.0625	-5.39E-01	5.83E-01	-3.28E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	6.88E-02
12	30	0.0625	-5.88E-01	5.55E-01	-3.28E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	6.27E-02
13	32.5	0.0625	-6.37E-01	5.29E-01	-3.28E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	5.73E-02
14	35	0.0625	-6.86E-01	5.03E-01	-3.28E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	5.25E-02
15	37.5	0.0625	-7.35E-01	4.79E-01	-3.28E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	4.81E-02
16	40	0.0625	-7.84E-01	4.56E-01	-3.28E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	4.43E-02
17	42.5	0.0625	-8.33E-01	4.35E-01	-3.28E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	4.08E-02
18	45	0.0625	-8.82E-01	4.14E-01	-3.28E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	3.76E-02
19	47.5	0.0625	-9.31E-01	3.94E-01	-3.28E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.47E-02
20	50	0.0625	-9.80E-01	3.75E-01	-3.28E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.21E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	0.0625	-4.90E-02	9.52E-01	-3.28E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	4.54E-01
2	5	0.0625	-9.80E-02	9.07E-01	-3.28E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	3.82E-01
3	7.5	0.0625	-1.47E-01	8.63E-01	-3.28E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	3.24E-01
4	10	0.0625	-1.96E-01	8.22E-01	-3.28E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.81E-01
5	12.5	0.0625	-2.45E-01	7.83E-01	-3.28E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.46E-01
6	15	0.0625	-2.94E-01	7.45E-01	-3.28E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.18E-01
7	17.5	0.0625	-3.43E-01	7.10E-01	-3.28E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.95E-01
8	20	0.0625	-3.92E-01	6.76E-01	-3.28E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.76E-01
9	22.5	0.0625	-4.41E-01	6.43E-01	-3.28E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.59E-01
10	25	0.0625	-4.90E-01	6.13E-01	-3.28E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	1.44E-01
11	27.5	0.0625	-5.39E-01	5.83E-01	-3.28E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.32E-01
12	30	0.0625	-5.88E-01	5.55E-01	-3.28E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.20E-01
13	32.5	0.0625	-6.37E-01	5.29E-01	-3.28E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.10E-01
14	35	0.0625	-6.86E-01	5.03E-01	-3.28E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	1.01E-01
15	37.5	0.0625	-7.35E-01	4.79E-01	-3.28E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	9.32E-02
16	40	0.0625	-7.84E-01	4.56E-01	-3.28E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	8.59E-02
17	42.5	0.0625	-8.33E-01	4.35E-01	-3.28E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	7.92E-02
18	45	0.0625	-8.82E-01	4.14E-01	-3.28E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	7.31E-02
19	47.5	0.0625	-9.31E-01	3.94E-01	-3.28E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.76E-02
20	50	0.0625	-9.80E-01	3.75E-01	-3.28E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	6.26E-02



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	16.07.2021		Version:	1
Contaminant	Ethylbenzene			
Target Concentration (C_T)	0.03	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Ethylbenzene**		
Target concentration	C_T	**0.03**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.40E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	4.47E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.15E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.29E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.03	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	16.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Ethylbenzene**		from Level 1
Target concentration	C_T	**0.03**	**mg/l**	from Level 1

This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**9.23E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		3.96E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	16.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Ethylbenzene		from Level 1
Target Concentration	C_T	0.03	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		65	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.50E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.62E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.15E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	8.98E+01	fraction
Decay rate used	λ	5.15E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.90E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	5.35E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.87E+01**	**fraction**
Calculated soil leachate concentration	Co	1.51E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**1.72E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	7.40E+00	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**5.35E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.47E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.15E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

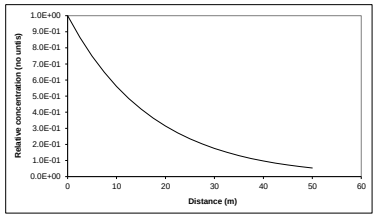
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	16.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	4.92E+00
2.5	8.65E-01	4.26E+00
5.0	7.49E-01	3.69E+00
7.5	6.48E-01	3.19E+00
10.0	5.61E-01	2.76E+00
12.5	4.85E-01	2.39E+00
15.0	4.20E-01	2.07E+00
17.5	3.63E-01	1.79E+00
20.0	3.14E-01	1.55E+00
22.5	2.72E-01	1.34E+00
25.0	2.35E-01	1.16E+00
27.5	2.03E-01	9.98E-01
30.0	1.75E-01	8.62E-01
32.5	1.51E-01	7.44E-01
35.0	1.31E-01	6.42E-01
37.5	1.13E-01	5.54E-01
40.0	9.71E-02	4.78E-01
42.5	8.37E-02	4.12E-01
45.0	7.21E-02	3.55E-01
47.5	6.22E-02	3.06E-01
50.0	5.35E-02	2.63E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

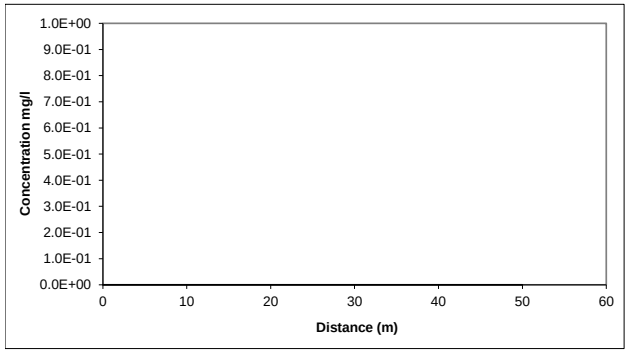
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.40E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	4.15E+00	l/kg
Factor (partitioning between soil and water)		4.29E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.87E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Ethylbenzene		from Level 1
Target Concentration	C_T	3.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	9.70E+00	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.50E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.62E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.15E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	8.98E+01	fraction
Decay rate used	λ	5.15E-04	d^{-1}
Rate of contaminant flow due to retardation	u	4.66E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	6.18E-02	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.57E+02**	

Remedial Targets

Remedial Target		**4.71E+00**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**6.18E-02**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.47E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.15E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

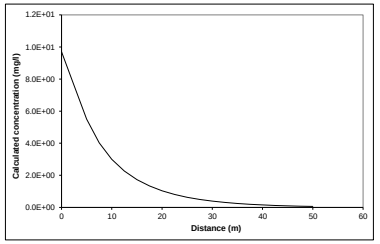
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	16.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	9.7E+00
2.5	7.60E+00
5.0	5.50E+00
7.5	4.03E+00
10.0	3.00E+00
12.5	2.27E+00
15.0	1.73E+00
17.5	1.34E+00
20.0	1.04E+00
22.5	8.07E-01
25.0	6.32E-01
27.5	4.97E-01
30.0	3.91E-01
32.5	3.09E-01
35.0	2.44E-01
37.5	1.94E-01
40.0	1.54E-01
42.5	1.22E-01
45.0	9.73E-02
47.5	7.75E-02
50.0	6.18E-02

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Ethylbenzene**

Parameter	Value	Units
(carried over from input sheet)		
C_T	3.00E-02	mg/l
Kd	4.15E+00	l/kg
foc	9.30E-03	fraction
koc	4.47E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.40E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			4.15E+00	l/kg

Calculated Remedial Target	**1.29E-01**	**mg/kg**	**for**	**Ethylbenzene**

Factor (partitioning between soil and water) 4.29E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	16.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Ethylbenzene**

Site assessed:	Tetrosyl
Date:	16.07.2021
Version:	1

Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	3.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

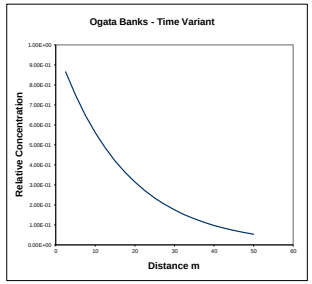
OGATA BANKS SOLUTION

Contaminant	Ethylbenzene

Input	Value	Units
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.149E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.154E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

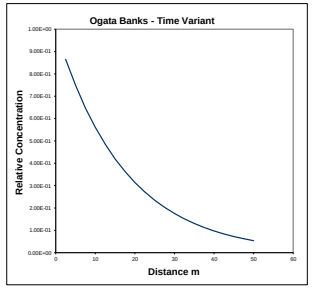
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.45E-01	8.65E-01	-9.27E+47	2	6.45E-01	1.91E+00	9.27E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.65E-01
2	5	0.13	-2.89E-01	7.49E-01	-9.27E+47	2	1.29E+00	3.63E+00	9.27E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.49E-01
3	7.5	0.13	-4.34E-01	6.48E-01	-9.27E+47	2	1.93E+00	6.92E+00	9.27E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.48E-01
4	10	0.13	-5.79E-01	5.61E-01	-9.27E+47	2	2.58E+00	1.32E+01	9.27E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.61E-01
5	12.5	0.13	-7.23E-01	4.85E-01	-9.27E+47	2	3.22E+00	2.51E+01	9.27E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.85E-01
6	15	0.13	-8.68E-01	4.20E-01	-9.27E+47	2	3.87E+00	4.78E+01	9.27E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	4.20E-01
7	17.5	0.13	-1.01E+00	3.63E-01	-9.27E+47	2	4.51E+00	9.11E+01	9.27E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.63E-01
8	20	0.13	-1.16E+00	3.14E-01	-9.27E+47	2	5.16E+00	1.74E+02	9.27E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	3.14E-01
9	22.5	0.13	-1.30E+00	2.72E-01	-9.27E+47	2	5.80E+00	3.31E+02	9.27E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.72E-01
10	25	0.13	-1.45E+00	2.35E-01	-9.27E+47	2	6.45E+00	6.30E+02	9.27E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.35E-01
11	27.5	0.13	-1.59E+00	2.04E-01	-9.27E+47	2	7.09E+00	1.20E+03	9.27E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	2.03E-01
12	30	0.13	-1.74E+00	1.76E-01	-9.27E+47	2	7.74E+00	2.29E+03	9.27E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.75E-01
13	32.5	0.13	-1.88E+00	1.53E-01	-9.27E+47	2	8.38E+00	4.36E+03	9.27E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.51E-01
14	35	0.13	-2.03E+00	1.32E-01	-9.27E+47	2	9.03E+00	8.31E+03	9.27E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.30E-01
15	37.5	0.13	-2.17E+00	1.14E-01	-9.27E+47	2	9.67E+00	1.58E+04	9.27E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	1.13E-01
16	40	0.13	-2.31E+00	9.88E-02	-9.27E+47	2	1.03E+01	3.02E+04	9.27E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	9.70E-02
17	42.5	0.13	-2.46E+00	8.55E-02	-9.27E+47	2	1.10E+01	5.75E+04	9.27E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	8.36E-02
18	45	0.13	-2.60E+00	7.40E-02	-9.27E+47	2	1.16E+01	1.09E+05	9.27E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	7.21E-02
19	47.5	0.13	-2.75E+00	6.40E-02	-9.27E+47	2	1.22E+01	2.09E+05	9.27E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	6.21E-02
20	50	0.13	-2.89E+00	5.54E-02	-9.27E+47	2	1.29E+01	3.97E+05	9.27E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	5.34E-02



Calc	Value	
v	0.6195	m/d
Rc	89.7512	
u	0.0069	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.45E-01	8.65E-01	-9.27E+47	2	6.45E-01	1.91E+00	9.27E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.65E-01
2	5	0.13	-2.89E-01	7.49E-01	-9.27E+47	2	1.29E+00	3.63E+00	9.27E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.49E-01
3	7.5	0.13	-4.34E-01	6.48E-01	-9.27E+47	2	1.93E+00	6.92E+00	9.27E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.48E-01
4	10	0.13	-5.79E-01	5.61E-01	-9.27E+47	2	2.58E+00	1.32E+01	9.27E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.61E-01
5	12.5	0.13	-7.23E-01	4.85E-01	-9.27E+47	2	3.22E+00	2.51E+01	9.27E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.85E-01
6	15	0.13	-8.68E-01	4.20E-01	-9.27E+47	2	3.87E+00	4.78E+01	9.27E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	4.20E-01
7	17.5	0.13	-1.01E+00	3.63E-01	-9.27E+47	2	4.51E+00	9.11E+01	9.27E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.63E-01
8	20	0.13	-1.16E+00	3.14E-01	-9.27E+47	2	5.16E+00	1.74E+02	9.27E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	3.14E-01
9	22.5	0.13	-1.30E+00	2.72E-01	-9.27E+47	2	5.80E+00	3.31E+02	9.27E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.72E-01
10	25	0.13	-1.45E+00	2.35E-01	-9.27E+47	2	6.45E+00	6.30E+02	9.27E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.35E-01
11	27.5	0.13	-1.59E+00	2.04E-01	-9.27E+47	2	7.09E+00	1.20E+03	9.27E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	2.03E-01
12	30	0.13	-1.74E+00	1.76E-01	-9.27E+47	2	7.74E+00	2.29E+03	9.27E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.75E-01
13	32.5	0.13	-1.88E+00	1.53E-01	-9.27E+47	2	8.38E+00	4.36E+03	9.27E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.51E-01
14	35	0.13	-2.03E+00	1.32E-01	-9.27E+47	2	9.03E+00	8.31E+03	9.27E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.31E-01
15	37.5	0.13	-2.17E+00	1.14E-01	-9.27E+47	2	9.67E+00	1.58E+04	9.27E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	1.13E-01
16	40	0.13	-2.31E+00	9.88E-02	-9.27E+47	2	1.03E+01	3.02E+04	9.27E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	9.71E-02
17	42.5	0.13	-2.46E+00	8.55E-02	-9.27E+47	2	1.10E+01	5.75E+04	9.27E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	8.37E-02
18	45	0.13	-2.60E+00	7.40E-02	-9.27E+47	2	1.16E+01	1.09E+05	9.27E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	7.21E-02
19	47.5	0.13	-2.75E+00	6.40E-02	-9.27E+47	2	1.22E+01	2.09E+05	9.27E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	6.22E-02
20	50	0.13	-2.89E+00	5.54E-02	-9.27E+47	2	1.29E+01	3.97E+05	9.27E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	5.35E-02



Date:	16.07.2021
Version:	1

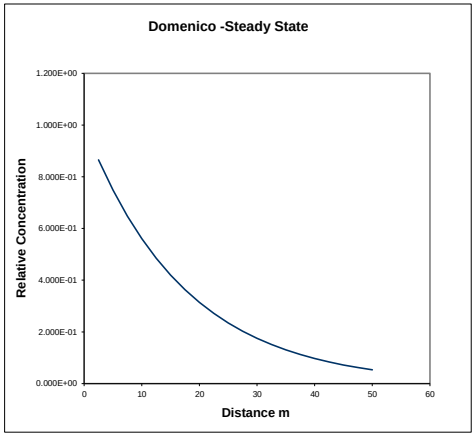
Contaminant **Ethylbenzene**

Input	Value	Units
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.149E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.154E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.45E-01	8.65E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.653E-01
2	5	0.25	-2.89E-01	7.49E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.488E-01
3	7.5	0.25	-4.34E-01	6.48E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.480E-01
4	10	0.25	-5.79E-01	5.61E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.607E-01
5	12.5	0.25	-7.23E-01	4.85E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.852E-01
6	15	0.25	-8.68E-01	4.20E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	4.198E-01
7	17.5	0.25	-1.01E+00	3.63E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.632E-01
8	20	0.25	-1.16E+00	3.14E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	3.141E-01
9	22.5	0.25	-1.30E+00	2.72E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.716E-01
10	25	0.25	-1.45E+00	2.35E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.348E-01
11	27.5	0.25	-1.59E+00	2.04E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	2.028E-01
12	30	0.25	-1.74E+00	1.76E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.752E-01
13	32.5	0.25	-1.88E+00	1.53E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.512E-01
14	35	0.25	-2.03E+00	1.32E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.305E-01
15	37.5	0.25	-2.17E+00	1.14E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	1.126E-01
16	40	0.25	-2.31E+00	9.88E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	9.704E-02
17	42.5	0.25	-2.46E+00	8.55E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	8.364E-02
18	45	0.25	-2.60E+00	7.40E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	7.206E-02
19	47.5	0.25	-2.75E+00	6.40E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	6.207E-02
20	50	0.25	-2.89E+00	5.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	5.345E-02



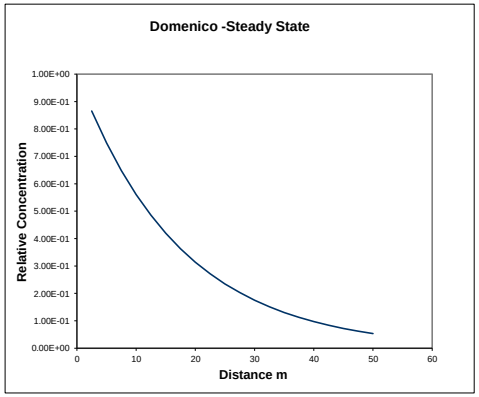
Calc **Value**

v	6.19E-01	m/d
Rc	8.98E+01	
u	6.90E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.45E-01	8.65E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.65E-01
2	5	0.25	-2.89E-01	7.49E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.49E-01
3	7.5	0.25	-4.34E-01	6.48E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.48E-01
4	10	0.25	-5.79E-01	5.61E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.61E-01
5	12.5	0.25	-7.23E-01	4.85E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.85E-01
6	15	0.25	-8.68E-01	4.20E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	4.20E-01
7	17.5	0.25	-1.01E+00	3.63E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.63E-01
8	20	0.25	-1.16E+00	3.14E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	3.14E-01
9	22.5	0.25	-1.30E+00	2.72E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.72E-01
10	25	0.25	-1.45E+00	2.35E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.35E-01
11	27.5	0.25	-1.59E+00	2.04E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	2.03E-01
12	30	0.25	-1.74E+00	1.76E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.75E-01
13	32.5	0.25	-1.88E+00	1.53E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.51E-01
14	35	0.25	-2.03E+00	1.32E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.31E-01
15	37.5	0.25	-2.17E+00	1.14E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	1.13E-01
16	40	0.25	-2.31E+00	9.88E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	9.71E-02
17	42.5	0.25	-2.46E+00	8.55E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	8.37E-02
18	45	0.25	-2.60E+00	7.40E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	7.21E-02
19	47.5	0.25	-2.75E+00	6.40E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	6.22E-02
20	50	0.25	-2.89E+00	5.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	5.35E-02



Date:	16.07.2021
Version:	1

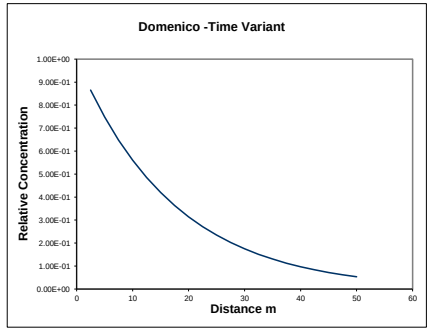
DOMENICO (TIME VARIANT)

Contaminant **Ethylbenzene**

Input	Value	Units
C_T	0.03	mg/l
DF	3.0774	
λ	5.149E-04	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.154E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.45E-01	8.65E-01	-9.27E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.65E-01
2	5	0.125	-2.89E-01	7.49E-01	-9.27E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.49E-01
3	7.5	0.125	-4.34E-01	6.48E-01	-9.27E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.48E-01
4	10	0.125	-5.79E-01	5.61E-01	-9.27E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.61E-01
5	12.5	0.125	-7.23E-01	4.85E-01	-9.27E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.85E-01
6	15	0.125	-8.68E-01	4.20E-01	-9.27E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	4.20E-01
7	17.5	0.125	-1.01E+00	3.63E-01	-9.27E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.63E-01
8	20	0.125	-1.16E+00	3.14E-01	-9.27E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	3.14E-01
9	22.5	0.125	-1.30E+00	2.72E-01	-9.27E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.72E-01
10	25	0.125	-1.45E+00	2.35E-01	-9.27E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.35E-01
11	27.5	0.125	-1.59E+00	2.04E-01	-9.27E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	2.03E-01
12	30	0.125	-1.74E+00	1.76E-01	-9.27E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.75E-01
13	32.5	0.125	-1.88E+00	1.53E-01	-9.27E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.51E-01
14	35	0.125	-2.03E+00	1.32E-01	-9.27E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.30E-01
15	37.5	0.125	-2.17E+00	1.14E-01	-9.27E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	1.13E-01
16	40	0.125	-2.31E+00	9.88E-02	-9.27E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	9.70E-02
17	42.5	0.125	-2.46E+00	8.55E-02	-9.27E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	8.36E-02
18	45	0.125	-2.60E+00	7.40E-02	-9.27E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	7.21E-02
19	47.5	0.125	-2.75E+00	6.40E-02	-9.27E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	6.21E-02
20	50	0.125	-2.89E+00	5.54E-02	-9.27E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	5.34E-02

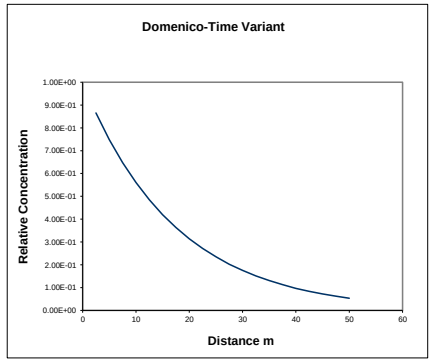


Calc **Value**

v	6.19E-01	m/d
Rc	8.98E+01	
u	6.90E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.45E-01	8.65E-01	-9.27E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.65E-01
2	5	0.125	-2.89E-01	7.49E-01	-9.27E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.49E-01
3	7.5	0.125	-4.34E-01	6.48E-01	-9.27E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.48E-01
4	10	0.125	-5.79E-01	5.61E-01	-9.27E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.61E-01
5	12.5	0.125	-7.23E-01	4.85E-01	-9.27E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.85E-01
6	15	0.125	-8.68E-01	4.20E-01	-9.27E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	4.20E-01
7	17.5	0.125	-1.01E+00	3.63E-01	-9.27E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.63E-01
8	20	0.125	-1.16E+00	3.14E-01	-9.27E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	3.14E-01
9	22.5	0.125	-1.30E+00	2.72E-01	-9.27E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.72E-01
10	25	0.125	-1.45E+00	2.35E-01	-9.27E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.35E-01
11	27.5	0.125	-1.59E+00	2.04E-01	-9.27E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	2.03E-01
12	30	0.125	-1.74E+00	1.76E-01	-9.27E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.75E-01
13	32.5	0.125	-1.88E+00	1.53E-01	-9.27E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.51E-01
14	35	0.125	-2.03E+00	1.32E-01	-9.27E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.31E-01
15	37.5	0.125	-2.17E+00	1.14E-01	-9.27E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	1.13E-01
16	40	0.125	-2.31E+00	9.88E-02	-9.27E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	9.71E-02
17	42.5	0.125	-2.46E+00	8.55E-02	-9.27E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	8.37E-02
18	45	0.125	-2.60E+00	7.40E-02	-9.27E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	7.21E-02
19	47.5	0.125	-2.75E+00	6.40E-02	-9.27E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	6.22E-02
20	50	0.125	-2.89E+00	5.54E-02	-9.27E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	5.35E-02



Date:	16.07.2021
Version:	1

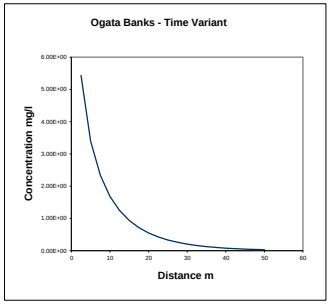
OGATA BANKS SOLUTION

Contaminant	Ethylbenzene	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	9.70E+00	mg/l
λ	5.15E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.15E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

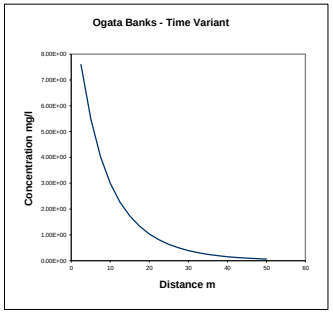
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	1.2125	-2.0E-01	8.2E-01	-2.7E+48	2.000	7.0E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	5.43E+00
2	5	1.2125	-4.0E-01	6.7E-01	-2.7E+48	2.000	1.4E+00	4.0E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	3.40E+00
3	7.5	1.2125	-5.9E-01	5.5E-01	-2.7E+48	2.000	2.1E+00	8.1E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	2.34E+00
4	10	1.2125	-7.9E-01	4.5E-01	-2.7E+48	2.000	2.8E+00	1.6E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	1.68E+00
5	12.5	1.2125	-9.9E-01	3.7E-01	-2.7E+48	2.000	3.5E+00	3.3E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.24E+00
6	15	1.2125	-1.2E+00	3.0E-01	-2.7E+48	2.000	4.2E+00	6.6E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	9.37E-01
7	17.5	1.2125	-1.4E+00	2.5E-01	-2.7E+48	2.000	4.9E+00	1.3E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	7.15E-01
8	20	1.2125	-1.6E+00	2.1E-01	-2.7E+48	2.000	5.6E+00	2.7E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	5.50E-01
9	22.5	1.2125	-1.8E+00	1.7E-01	-2.7E+48	2.000	6.3E+00	5.3E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.26E-01
10	25	1.2125	-2.0E+00	1.4E-01	-2.7E+48	2.000	7.0E+00	1.1E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	3.32E-01
11	27.5	1.2125	-2.2E+00	1.1E-01	-2.7E+48	2.000	7.7E+00	2.2E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	2.59E-01
12	30	1.2125	-2.4E+00	9.3E-02	-2.7E+48	2.000	8.4E+00	4.3E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.04E-01
13	32.5	1.2125	-2.6E+00	7.6E-02	-2.7E+48	2.000	9.1E+00	8.7E+03	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.60E-01
14	35	1.2125	-2.8E+00	6.3E-02	-2.7E+48	2.000	9.8E+00	1.8E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.27E-01
15	37.5	1.2125	-3.0E+00	5.1E-02	-2.7E+48	2.000	1.0E+01	3.5E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.00E-01
16	40	1.2125	-3.2E+00	4.2E-02	-2.7E+48	2.000	1.1E+01	7.1E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	7.93E-02
17	42.5	1.2125	-3.4E+00	3.5E-02	-2.7E+48	2.000	1.2E+01	1.4E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	6.29E-02
18	45	1.2125	-3.6E+00	2.8E-02	-2.7E+48	2.000	1.3E+01	2.9E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	5.00E-02
19	47.5	1.2125	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	5.7E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.98E-02
20	50	1.2125	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.4E+01	1.2E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.17E-02



Calc	Value	
v	4.18E-01	m/d
Rc	8.98E+01	
u	4.66E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	1.2125	-2.0E-01	8.2E-01	-2.7E+48	2.000	7.0E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	7.60E+00
2	5	1.2125	-4.0E-01	6.7E-01	-2.7E+48	2.000	1.4E+00	4.0E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	5.50E+00
3	7.5	1.2125	-5.9E-01	5.5E-01	-2.7E+48	2.000	2.1E+00	8.1E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	4.03E+00
4	10	1.2125	-7.9E-01	4.5E-01	-2.7E+48	2.000	2.8E+00	1.6E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	3.00E+00
5	12.5	1.2125	-9.9E-01	3.7E-01	-2.7E+48	2.000	3.5E+00	3.3E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.27E+00
6	15	1.2125	-1.2E+00	3.0E-01	-2.7E+48	2.000	4.2E+00	6.6E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	1.73E+00
7	17.5	1.2125	-1.4E+00	2.5E-01	-2.7E+48	2.000	4.9E+00	1.3E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.34E+00
8	20	1.2125	-1.6E+00	2.1E-01	-2.7E+48	2.000	5.6E+00	2.7E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.04E+00
9	22.5	1.2125	-1.8E+00	1.7E-01	-2.7E+48	2.000	6.3E+00	5.3E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	8.07E-01
10	25	1.2125	-2.0E+00	1.4E-01	-2.7E+48	2.000	7.0E+00	1.1E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	6.32E-01
11	27.5	1.2125	-2.2E+00	1.1E-01	-2.7E+48	2.000	7.7E+00	2.2E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	4.97E-01
12	30	1.2125	-2.4E+00	9.3E-02	-2.7E+48	2.000	8.4E+00	4.3E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	3.91E-01
13	32.5	1.2125	-2.6E+00	7.6E-02	-2.7E+48	2.000	9.1E+00	8.7E+03	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	3.09E-01
14	35	1.2125	-2.8E+00	6.3E-02	-2.7E+48	2.000	9.8E+00	1.8E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.44E-01
15	37.5	1.2125	-3.0E+00	5.1E-02	-2.7E+48	2.000	1.0E+01	3.5E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	1.94E-01
16	40	1.2125	-3.2E+00	4.2E-02	-2.7E+48	2.000	1.1E+01	7.1E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.54E-01
17	42.5	1.2125	-3.4E+00	3.5E-02	-2.7E+48	2.000	1.2E+01	1.4E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.22E-01
18	45	1.2125	-3.6E+00	2.8E-02	-2.7E+48	2.000	1.3E+01	2.9E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	9.73E-02
19	47.5	1.2125	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	5.7E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	7.75E-02
20	50	1.2125	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.4E+01	1.2E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	6.18E-02



Date:	16.07.2021
Version:	1

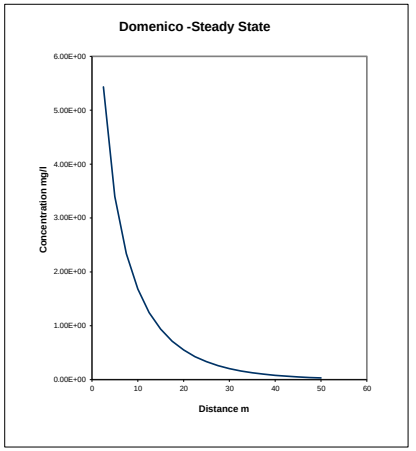
DOMENICO (STEADY STATE)

Contaminant **Ethylbenzene**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.03	mg/l
Co	9.70E+00	mg/l
λ	5.15E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.15E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	2.425	-1.98E-01	8.20E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	5.43E+00
2	5	2.425	-3.96E-01	6.73E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	3.40E+00
3	7.5	2.425	-5.94E-01	5.52E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	2.34E+00
4	10	2.425	-7.92E-01	4.53E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	1.68E+00
5	12.5	2.425	-9.90E-01	3.72E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.24E+00
6	15	2.425	-1.19E+00	3.05E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	9.37E-01
7	17.5	2.425	-1.39E+00	2.50E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	7.15E-01
8	20	2.425	-1.58E+00	2.05E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	5.50E-01
9	22.5	2.425	-1.78E+00	1.68E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.26E-01
10	25	2.425	-1.98E+00	1.38E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	3.32E-01
11	27.5	2.425	-2.18E+00	1.13E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	2.59E-01
12	30	2.425	-2.38E+00	9.30E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.04E-01
13	32.5	2.425	-2.57E+00	7.63E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.60E-01
14	35	2.425	-2.77E+00	6.26E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.27E-01
15	37.5	2.425	-2.97E+00	5.14E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.00E-01
16	40	2.425	-3.17E+00	4.21E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	7.93E-02
17	42.5	2.425	-3.36E+00	3.46E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	6.29E-02
18	45	2.425	-3.56E+00	2.84E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	5.00E-02
19	47.5	2.425	-3.76E+00	2.33E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.98E-02
20	50	2.425	-3.96E+00	1.91E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.17E-02



Vertical dispersion optio Simulate vertical dispersion in 1 direction

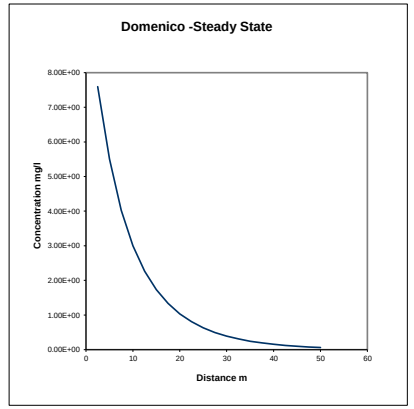
Calc **Value**

v	4.18E-01	m/d
Rc	8.98E+01	
u	4.66E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	2.425	-1.98E-01	8.20E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	7.60E+00
2	5	2.425	-3.96E-01	6.73E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	5.50E+00
3	7.5	2.425	-5.94E-01	5.52E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	4.03E+00
4	10	2.425	-7.92E-01	4.53E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	3.00E+00
5	12.5	2.425	-9.90E-01	3.72E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.27E+00
6	15	2.425	-1.19E+00	3.05E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	1.73E+00
7	17.5	2.425	-1.39E+00	2.50E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.34E+00
8	20	2.425	-1.58E+00	2.05E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.04E+00
9	22.5	2.425	-1.78E+00	1.68E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	8.07E-01
10	25	2.425	-1.98E+00	1.38E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	6.32E-01
11	27.5	2.425	-2.18E+00	1.13E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	4.97E-01
12	30	2.425	-2.38E+00	9.30E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	3.91E-01
13	32.5	2.425	-2.57E+00	7.63E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	3.09E-01
14	35	2.425	-2.77E+00	6.26E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.44E-01
15	37.5	2.425	-2.97E+00	5.14E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	1.94E-01
16	40	2.425	-3.17E+00	4.21E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.54E-01
17	42.5	2.425	-3.36E+00	3.46E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.22E-01
18	45	2.425	-3.56E+00	2.84E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	9.73E-02
19	47.5	2.425	-3.76E+00	2.33E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	7.75E-02
20	50	2.425	-3.96E+00	1.91E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	6.18E-02



Date:	16.07.2021
Version:	1

DOMENICO (TIME VARIANT)

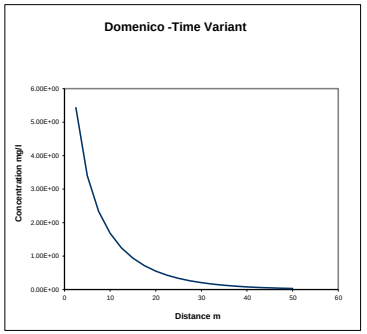
Contaminant	Ethylbenzene	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	9.70E+00	mg/l
λ	5.15E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.15E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	8.98E+01	
u	4.66E-03	m/d

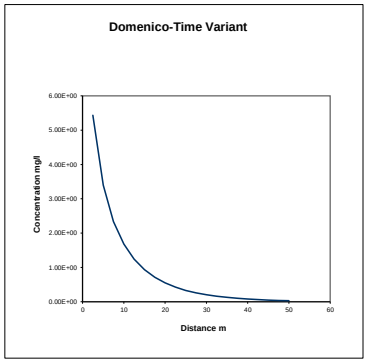
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	1.2125	-1.98E-01	8.20E-01	-2.73E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	5.43E+00
2	5	1.2125	-3.96E-01	6.73E-01	-2.73E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	3.40E+00
3	7.5	1.2125	-5.94E-01	5.52E-01	-2.73E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	2.34E+00
4	10	1.2125	-7.92E-01	4.53E-01	-2.73E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	1.68E+00
5	12.5	1.2125	-9.90E-01	3.72E-01	-2.73E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.24E+00
6	15	1.2125	-1.19E+00	3.05E-01	-2.73E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	9.37E-01
7	17.5	1.2125	-1.39E+00	2.50E-01	-2.73E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	7.15E-01
8	20	1.2125	-1.58E+00	2.05E-01	-2.73E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	5.50E-01
9	22.5	1.2125	-1.78E+00	1.68E-01	-2.73E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.26E-01
10	25	1.2125	-1.98E+00	1.38E-01	-2.73E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	3.32E-01
11	27.5	1.2125	-2.18E+00	1.13E-01	-2.73E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	2.59E-01
12	30	1.2125	-2.38E+00	9.30E-02	-2.73E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.04E-01
13	32.5	1.2125	-2.57E+00	7.63E-02	-2.73E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.60E-01
14	35	1.2125	-2.77E+00	6.26E-02	-2.73E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.27E-01
15	37.5	1.2125	-2.97E+00	5.14E-02	-2.73E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.00E-01
16	40	1.2125	-3.17E+00	4.21E-02	-2.73E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	7.93E-02
17	42.5	1.2125	-3.36E+00	3.46E-02	-2.73E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	6.29E-02
18	45	1.2125	-3.56E+00	2.84E-02	-2.73E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	5.00E-02
19	47.5	1.2125	-3.76E+00	2.33E-02	-2.73E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.98E-02
20	50	1.2125	-3.96E+00	1.91E-02	-2.73E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.17E-02



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	1.2125	-1.98E-01	8.20E-01	-2.73E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	7.60E+00
2	5	1.2125	-3.96E-01	6.73E-01	-2.73E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	5.50E+00
3	7.5	1.2125	-5.94E-01	5.52E-01	-2.73E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	4.03E+00
4	10	1.2125	-7.92E-01	4.53E-01	-2.73E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	3.00E+00
5	12.5	1.2125	-9.90E-01	3.72E-01	-2.73E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.27E+00
6	15	1.2125	-1.19E+00	3.05E-01	-2.73E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	1.73E+00
7	17.5	1.2125	-1.39E+00	2.50E-01	-2.73E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.34E+00
8	20	1.2125	-1.58E+00	2.05E-01	-2.73E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.04E+00
9	22.5	1.2125	-1.78E+00	1.68E-01	-2.73E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	8.07E-01
10	25	1.2125	-1.98E+00	1.38E-01	-2.73E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	6.32E-01
11	27.5	1.2125	-2.18E+00	1.13E-01	-2.73E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	4.97E-01
12	30	1.2125	-2.38E+00	9.30E-02	-2.73E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	3.91E-01
13	32.5	1.2125	-2.57E+00	7.63E-02	-2.73E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	3.09E-01
14	35	1.2125	-2.77E+00	6.26E-02	-2.73E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.44E-01
15	37.5	1.2125	-2.97E+00	5.14E-02	-2.73E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	1.94E-01
16	40	1.2125	-3.17E+00	4.21E-02	-2.73E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.54E-01
17	42.5	1.2125	-3.36E+00	3.46E-02	-2.73E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.22E-01
18	45	1.2125	-3.56E+00	2.84E-02	-2.73E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	9.73E-02
19	47.5	1.2125	-3.76E+00	2.33E-02	-2.73E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	7.75E-02
20	50	1.2125	-3.96E+00	1.91E-02	-2.73E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	6.18E-02



Date:	16.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Tolune			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Toluene		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.39E-03	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	1.49E-02	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.03E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**3.30E+01**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

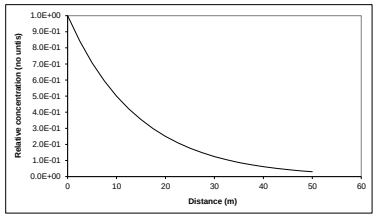
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	8.41E-01	7.24E+00
5.0	7.07E-01	6.09E+00
7.5	5.95E-01	5.12E+00
10.0	5.00E-01	4.31E+00
12.5	4.21E-01	3.62E+00
15.0	3.54E-01	3.05E+00
17.5	2.97E-01	2.56E+00
20.0	2.50E-01	2.15E+00
22.5	2.10E-01	1.81E+00
25.0	1.77E-01	1.52E+00
27.5	1.48E-01	1.28E+00
30.0	1.24E-01	1.07E+00
32.5	1.04E-01	8.99E-01
35.0	8.76E-02	7.54E-01
37.5	7.34E-02	6.32E-01
40.0	6.15E-02	5.30E-01
42.5	5.16E-02	4.44E-01
45.0	4.32E-02	3.72E-01
47.5	3.62E-02	3.11E-01
50.0	3.03E-02	2.61E-01

Remedial Targets

Level 3 Remedial Target		**7.52E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		1.53E+01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**50**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**3.03E-02**	**fraction**	Domenico - Steady state

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

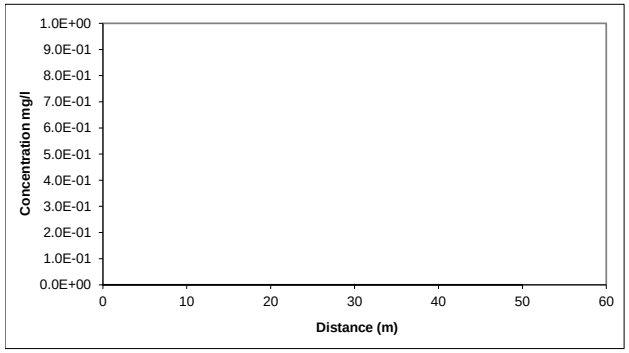
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	3.30E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.39E-03	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.34E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**3.29E+02**	

Remedial Targets

Remedial Target		**2.44E+01**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**5.34E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

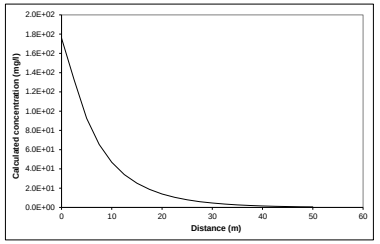
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report $ax = 0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.33E+02
5.0	9.26E+01
7.5	6.53E+01
10.0	4.69E+01
12.5	3.42E+01
15.0	2.51E+01
17.5	1.87E+01
20.0	1.40E+01
22.5	1.05E+01
25.0	7.91E+00
27.5	5.99E+00
30.0	4.55E+00
32.5	3.46E+00
35.0	2.64E+00
37.5	2.01E+00
40.0	1.54E+00
42.5	1.18E+00
45.0	9.05E-01
47.5	6.95E-01
50.0	5.34E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Toluene**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 1.90E+00 l/kg

Calculated Remedial Target 1.51E-01 mg/kg for Toluene

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

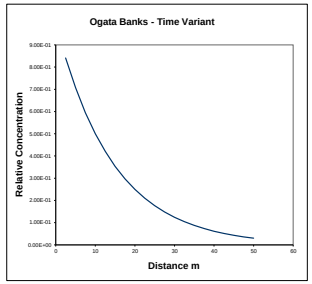
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	1.391E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	1.897E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

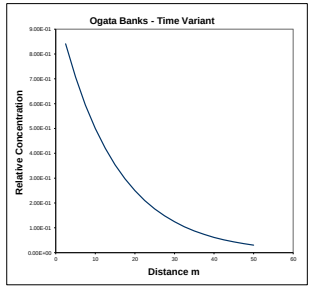
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-1.46E+48	2	6.73E-01	1.96E+00	1.46E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-1.46E+48	2	1.35E+00	3.84E+00	1.46E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-1.46E+48	2	2.02E+00	7.53E+00	1.46E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-1.46E+48	2	2.69E+00	1.48E+01	1.46E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-1.46E+48	2	3.37E+00	2.90E+01	1.46E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-1.46E+48	2	4.04E+00	5.68E+01	1.46E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-1.46E+48	2	4.71E+00	1.11E+02	1.46E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-1.46E+48	2	5.39E+00	2.18E+02	1.46E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-1.46E+48	2	6.06E+00	4.28E+02	1.46E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-1.46E+48	2	6.73E+00	8.38E+02	1.46E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-1.46E+48	2	7.40E+00	1.64E+03	1.46E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-1.46E+48	2	8.08E+00	3.22E+03	1.46E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-1.46E+48	2	8.75E+00	6.32E+03	1.46E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-1.46E+48	2	9.42E+00	1.24E+04	1.46E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-1.46E+48	2	1.01E+01	2.43E+04	1.46E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-1.46E+48	2	1.08E+01	4.76E+04	1.46E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-1.46E+48	2	1.14E+01	9.33E+04	1.46E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	5.15E-02
18	45	0.13	-3.12E+00	4.43E-02	-1.46E+48	2	1.21E+01	1.83E+05	1.46E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	4.31E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-1.46E+48	2	1.28E+01	3.59E+05	1.46E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	3.61E-02
20	50	0.13	-3.46E+00	3.13E-02	-1.46E+48	2	1.35E+01	7.03E+05	1.46E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	3.02E-02



Calc	Value	
v	0.6195	m/d
Rc	41.5311	
u	0.0149	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-1.46E+48	2	6.73E-01	1.96E+00	1.46E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-1.46E+48	2	1.35E+00	3.84E+00	1.46E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-1.46E+48	2	2.02E+00	7.53E+00	1.46E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-1.46E+48	2	2.69E+00	1.48E+01	1.46E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-1.46E+48	2	3.37E+00	2.90E+01	1.46E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-1.46E+48	2	4.04E+00	5.68E+01	1.46E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-1.46E+48	2	4.71E+00	1.11E+02	1.46E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-1.46E+48	2	5.39E+00	2.18E+02	1.46E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-1.46E+48	2	6.06E+00	4.28E+02	1.46E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-1.46E+48	2	6.73E+00	8.38E+02	1.46E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-1.46E+48	2	7.40E+00	1.64E+03	1.46E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-1.46E+48	2	8.08E+00	3.22E+03	1.46E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-1.46E+48	2	8.75E+00	6.32E+03	1.46E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-1.46E+48	2	9.42E+00	1.24E+04	1.46E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-1.46E+48	2	1.01E+01	2.43E+04	1.46E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-1.46E+48	2	1.08E+01	4.76E+04	1.46E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-1.46E+48	2	1.14E+01	9.33E+04	1.46E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.13	-3.12E+00	4.43E-02	-1.46E+48	2	1.21E+01	1.83E+05	1.46E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-1.46E+48	2	1.28E+01	3.59E+05	1.46E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.13	-3.46E+00	3.13E-02	-1.46E+48	2	1.35E+01	7.03E+05	1.46E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	3.03E-02

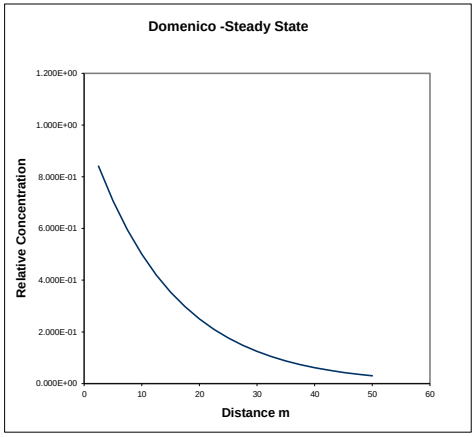


Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

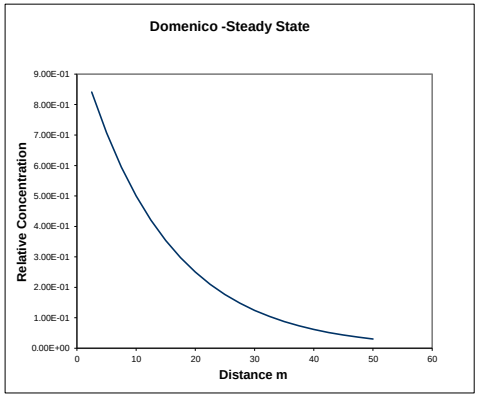
Contaminant	Toluene			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
Input	**Value**	**Units**														
C_T	7.400E-02	mg/l	1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.410E-01
DF	3.077E+00		2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.073E-01
			3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.949E-01
			4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.003E-01
λ	1.391E-03	$days^{-1}$	5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.207E-01
Sz	3.000E+01	m	6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.538E-01
Sy	1.400E+01	m	7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	2.975E-01
Kd	1.897E+00	l/kg	8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.501E-01
ρ	2.350E+00	g/cm3	9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.102E-01
n	1.100E-01		10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	1.765E-01
i	5.925E-02		11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.482E-01
K	1.150E+00	m/d	12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.244E-01
x	5.000E+01	m	13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.044E-01
z	0.000E+00	m	14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	8.755E-02
y	0.000E+00	m	15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	7.339E-02
ax	5.000E+00	m	16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	6.150E-02
az	5.000E-01	m	17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	5.152E-02
ay	5.000E-02	m	18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	4.314E-02
			19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	3.611E-02
			20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	3.022E-02



DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc	Value			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
v	6.19E-01	m/d														
Rc	4.15E+01															
u	1.49E-02	m/d	1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
			2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
			3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
			4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
			5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
			6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.54E-01
			7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	2.97E-01
			8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
			9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.10E-01
			10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
			11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.48E-01
			12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.24E-01
			13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.04E-01
			14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	8.76E-02
			15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	7.34E-02
			16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	6.15E-02
			17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
			18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	4.32E-02
			19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	3.62E-02
			20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	3.03E-02



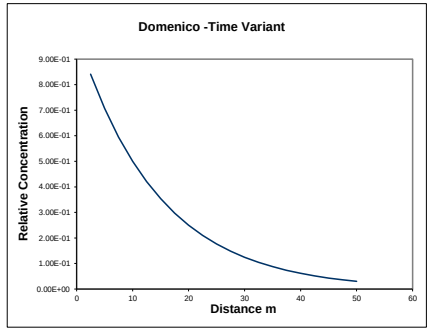
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
DF	3.0774	
λ	1.391E-03	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	1.897E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

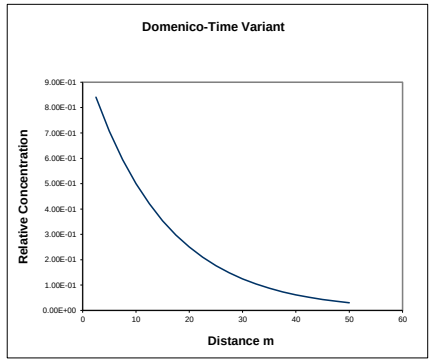
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.73E-01	8.41E-01	-1.46E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
2	5	0.125	-3.46E-01	7.07E-01	-1.46E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
3	7.5	0.125	-5.19E-01	5.95E-01	-1.46E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
4	10	0.125	-6.93E-01	5.00E-01	-1.46E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
5	12.5	0.125	-8.66E-01	4.21E-01	-1.46E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.21E-01
6	15	0.125	-1.04E+00	3.54E-01	-1.46E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.54E-01
7	17.5	0.125	-1.21E+00	2.98E-01	-1.46E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	2.97E-01
8	20	0.125	-1.39E+00	2.50E-01	-1.46E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.50E-01
9	22.5	0.125	-1.56E+00	2.10E-01	-1.46E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.10E-01
10	25	0.125	-1.73E+00	1.77E-01	-1.46E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	1.77E-01
11	27.5	0.125	-1.90E+00	1.49E-01	-1.46E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.48E-01
12	30	0.125	-2.08E+00	1.25E-01	-1.46E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.24E-01
13	32.5	0.125	-2.25E+00	1.05E-01	-1.46E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.04E-01
14	35	0.125	-2.42E+00	8.86E-02	-1.46E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	8.76E-02
15	37.5	0.125	-2.60E+00	7.45E-02	-1.46E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	7.34E-02
16	40	0.125	-2.77E+00	6.26E-02	-1.46E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	6.15E-02
17	42.5	0.125	-2.94E+00	5.27E-02	-1.46E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	5.15E-02
18	45	0.125	-3.12E+00	4.43E-02	-1.46E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	4.31E-02
19	47.5	0.125	-3.29E+00	3.73E-02	-1.46E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	3.61E-02
20	50	0.125	-3.46E+00	3.13E-02	-1.46E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	3.02E-02



Calc	Value	
v	6.19E-01	m/d
Rc	4.15E+01	
u	1.49E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.73E-01	8.41E-01	-1.46E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.125	-3.46E-01	7.07E-01	-1.46E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.125	-5.19E-01	5.95E-01	-1.46E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.125	-6.93E-01	5.00E-01	-1.46E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.125	-8.66E-01	4.21E-01	-1.46E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.125	-1.04E+00	3.54E-01	-1.46E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.125	-1.21E+00	2.98E-01	-1.46E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.125	-1.39E+00	2.50E-01	-1.46E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.125	-1.56E+00	2.10E-01	-1.46E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.125	-1.73E+00	1.77E-01	-1.46E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.125	-1.90E+00	1.49E-01	-1.46E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.125	-2.08E+00	1.25E-01	-1.46E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.125	-2.25E+00	1.05E-01	-1.46E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.125	-2.42E+00	8.86E-02	-1.46E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.125	-2.60E+00	7.45E-02	-1.46E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.125	-2.77E+00	6.26E-02	-1.46E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.125	-2.94E+00	5.27E-02	-1.46E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.125	-3.12E+00	4.43E-02	-1.46E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.125	-3.29E+00	3.73E-02	-1.46E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.125	-3.46E+00	3.13E-02	-1.46E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	3.03E-02



Date:	13.07.2021
Version:	1

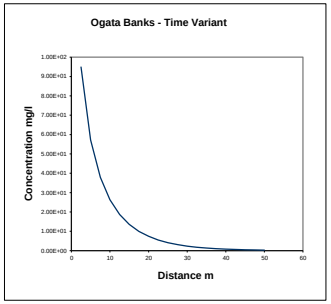
OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.39E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

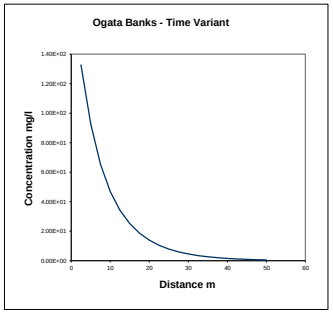
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	9.49E+01
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	5.72E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	3.79E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	2.63E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.88E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.36E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.00E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	7.41E+00
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	5.53E+00
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	4.15E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	3.13E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.37E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.80E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.37E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.04E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	7.95E-01
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	6.07E-01
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	4.65E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.57E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	2.74E-01



Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.33E+02
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	9.26E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	6.53E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	4.69E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	3.42E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.51E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.87E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.40E+01
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.05E+01
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.91E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	5.99E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	4.55E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	3.46E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.64E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	2.01E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.54E+00
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.18E+00
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	9.05E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.95E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.34E-01

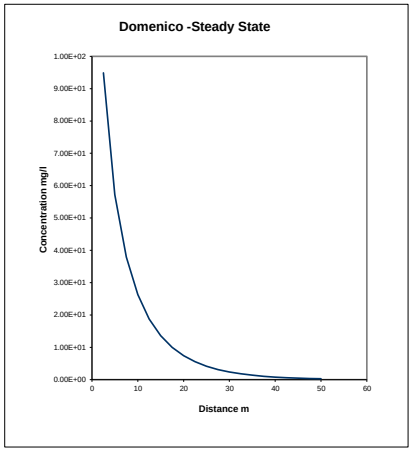


Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Tolune			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
Input	**Value**	**Units**														
C_T	0.074	mg/l	1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	9.49E+01
			2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	5.72E+01
			3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	3.79E+01
Co	1.76E+02	mg/l	4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	2.63E+01
λ	1.39E-03	$days^{-1}$	5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.88E+01
Sz	3.00E+01	m	6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.36E+01
Sy	1.00E+00	m	7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.00E+01
Kd	1.90E+00	l/kg	8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	7.41E+00
ρ	2.35E+00	g/cm3	9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	5.53E+00
n	1.10E-01		10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	4.15E+00
i	4.00E-02		11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
K	1.15E+00	m/d	12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.37E+00
x	5.00E+01	m	13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.80E+00
z	0.00E+00	m	14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.37E+00
y	0.00E+00	m	15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.04E+00
			16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	7.95E-01
ax	5.00E+00	m	17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	6.07E-01
az	5.00E-01	m	18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	4.65E-01
ay	5.00E-02	m	19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.57E-01
			20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	2.74E-01

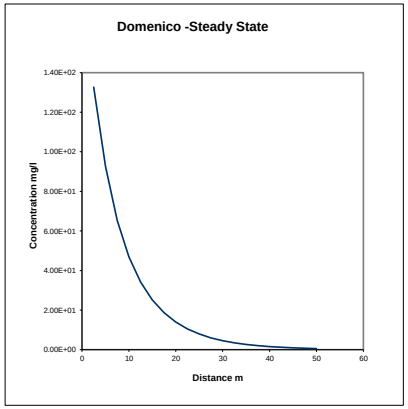


Vertical dispersion optio Simulate vertical dispersion in 1 direction

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

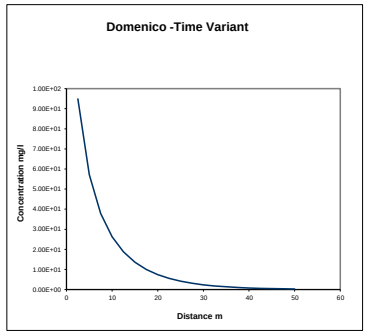
Calc	Value			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
v	4.18E-01	m/d	1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.33E+02
Rc	4.15E+01		2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	9.26E+01
u	1.01E-02	m/d	3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	6.53E+01
			4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	4.69E+01
			5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	3.42E+01
			6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.51E+01
			7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.87E+01
			8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.40E+01
			9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
			10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.91E+00
			11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	5.99E+00
			12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	4.55E+00
			13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	3.46E+00
			14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
			15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	2.01E+00
			16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.54E+00
			17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.18E+00
			18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	9.05E-01
			19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.95E-01
			20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.34E-01



Date:	13.07.2021
Version:	1

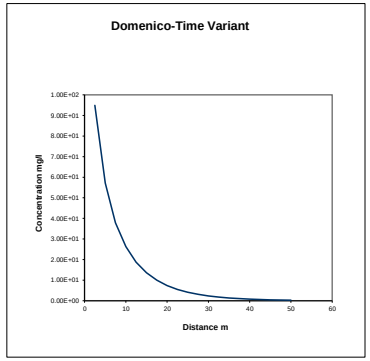
DOMENICO (TIME VARIANT)

Contaminant	Tolune																	
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)															
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	9.49E+01
			2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	5.72E+01
			3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	3.79E+01
Co	1.76E+02	mg/l	4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	2.63E+01
λ	1.39E-03	$days^{-1}$	5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.88E+01
Sz	3.00E+01	m	6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.36E+01
Sy	1.00E+00	m	7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.00E+01
Kd	1.90E+00	l/kg	8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	7.41E+00
ρ	2.35E+00	g/cm3	9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	5.53E+00
n	1.10E-01		10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	4.15E+00
i	4.00E-02		11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
K	1.15E+00	m/d	12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.37E+00
x	5.00E+01	m	13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.80E+00
z	0.00E+00	m	14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.37E+00
y	0.00E+00	m	15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.04E+00
t	1.00E+100	days	16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	7.95E-01
ax	5.00E+00	m	17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	6.07E-01
az	5.00E-01	m	18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	4.65E-01
ay	5.00E-02	m	19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.57E-01
			20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	2.74E-01



Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value																	
			Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT															
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
v	4.18E-01	m/d		m														
Rc	4.15E+01		1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.33E+02
u	1.01E-02	m/d	2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	9.26E+01
			3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	6.53E+01
			4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	4.69E+01
			5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	3.42E+01
			6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.51E+01
			7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.87E+01
			8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.40E+01
			9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
			10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.91E+00
			11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	5.99E+00
			12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	4.55E+00
			13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	3.46E+00
			14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
			15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	2.01E+00
			16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.54E+00
			17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.18E+00
			18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	9.05E-01
			19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.95E-01
			20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.34E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Xylenes			
Target Concentration (C_T)	0.03	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Environment Agency

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Xylenes**		
Target concentration	**C_T**	**0.03**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.12E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	4.90E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.56E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.41E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.03	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Xylenes**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.03** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**9.23E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.33E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Xylenes		from Level 1
Target Concentration	C_T	0.03	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		225	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	9.83E+01	fraction
Decay rate used	λ	5.03E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.30E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	4.53E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.21E+01**	**fraction**
Calculated soil leachate concentration	Co	4.80E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**2.04E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	9.56E+00	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**4.53E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.90E+02	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

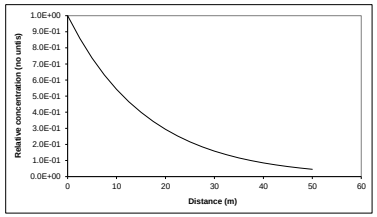
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	1.56E+01
2.5	8.58E-01	1.34E+01
5.0	7.36E-01	1.15E+01
7.5	6.32E-01	9.85E+00
10.0	5.42E-01	8.45E+00
12.5	4.65E-01	7.25E+00
15.0	3.99E-01	6.22E+00
17.5	3.43E-01	5.34E+00
20.0	2.94E-01	4.58E+00
22.5	2.52E-01	3.93E+00
25.0	2.16E-01	3.37E+00
27.5	1.85E-01	2.88E+00
30.0	1.58E-01	2.47E+00
32.5	1.36E-01	2.11E+00
35.0	1.16E-01	1.81E+00
37.5	9.93E-02	1.55E+00
40.0	8.49E-02	1.32E+00
42.5	7.26E-02	1.13E+00
45.0	6.21E-02	9.67E-01
47.5	5.30E-02	8.27E-01
50.0	4.53E-02	7.06E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

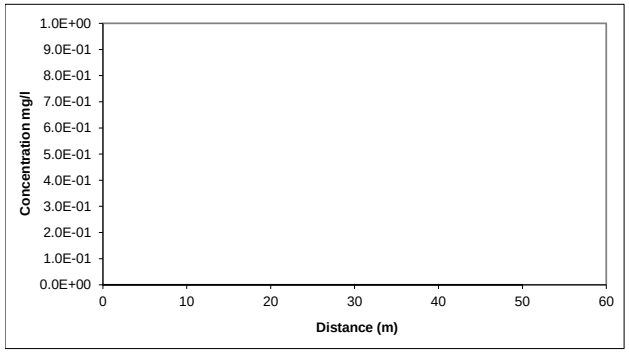
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.12E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	4.56E+00	l/kg
Factor (partitioning between soil and water)		4.69E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.21E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Xylenes		from Level 1
Target Concentration	C_T	3.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	3.78E+01	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.40E+01	days	R2174c-R10-App A
Calculated decay rate	λ	4.95E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.56E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	9.83E+01	fraction
Decay rate used	λ	5.04E-04	d^{-1}
Rate of contaminant flow due to retardation	u	4.25E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	1.94E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**1.95E+02**	

Remedial Targets

Remedial Target		**5.86E+00**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**1.94E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	4.90E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.56E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

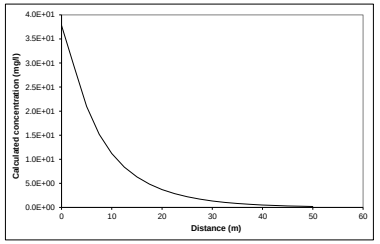
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	3.8E+01
2.5	2.93E+01
5.0	2.10E+01
7.5	1.52E+01
10.0	1.12E+01
12.5	8.37E+00
15.0	6.33E+00
17.5	4.82E+00
20.0	3.70E+00
22.5	2.85E+00
25.0	2.21E+00
27.5	1.72E+00
30.0	1.34E+00
32.5	1.04E+00
35.0	8.18E-01
37.5	6.41E-01
40.0	5.03E-01
42.5	3.96E-01
45.0	3.12E-01
47.5	2.46E-01
50.0	1.94E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Xylenes**

Parameter	Value	Units
(carried over from input sheet)		
C_T	3.00E-02	mg/l
Kd	4.56E+00	l/kg
foc	9.30E-03	fraction
koc	4.90E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.12E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			4.56E+00	l/kg

Calculated Remedial Target	**1.41E-01**	**mg/kg**	**for**	**Xylenes**

Factor (partitioning between soil and water) 4.69E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Xylenes**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

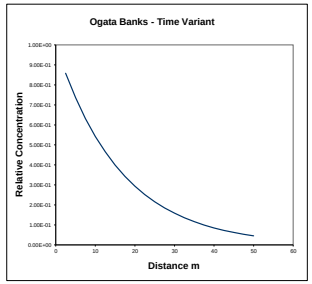
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	3.00E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.035E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

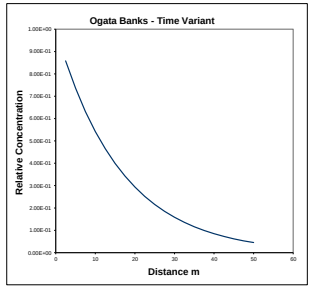
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-9.05E+47	2	6.53E-01	1.92E+00	9.05E+47	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-9.05E+47	2	1.31E+00	3.69E+00	9.05E+47	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-9.05E+47	2	1.96E+00	7.09E+00	9.05E+47	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-9.05E+47	2	2.61E+00	1.36E+01	9.05E+47	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-9.05E+47	2	3.26E+00	2.62E+01	9.05E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-9.05E+47	2	3.92E+00	5.03E+01	9.05E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-9.05E+47	2	4.57E+00	9.66E+01	9.05E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-9.05E+47	2	5.22E+00	1.86E+02	9.05E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-9.05E+47	2	5.88E+00	3.57E+02	9.05E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-9.05E+47	2	6.53E+00	6.85E+02	9.05E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-9.05E+47	2	7.18E+00	1.32E+03	9.05E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-9.05E+47	2	7.84E+00	2.53E+03	9.05E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-9.05E+47	2	8.49E+00	4.86E+03	9.05E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-9.05E+47	2	9.14E+00	9.34E+03	9.05E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-9.05E+47	2	9.79E+00	1.79E+04	9.05E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-9.05E+47	2	1.04E+01	3.45E+04	9.05E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-9.05E+47	2	1.11E+01	6.62E+04	9.05E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-9.05E+47	2	1.18E+01	1.27E+05	9.05E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	6.20E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-9.05E+47	2	1.24E+01	2.44E+05	9.05E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-9.05E+47	2	1.31E+01	4.70E+05	9.05E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	4.52E-02



Calc	Value	
v	0.6195	m/d
Rc	98.3342	
u	0.0063	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.53E-01	8.58E-01	-9.05E+47	2	6.53E-01	1.92E+00	9.05E+47	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.13	-3.06E-01	7.36E-01	-9.05E+47	2	1.31E+00	3.69E+00	9.05E+47	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.13	-4.59E-01	6.32E-01	-9.05E+47	2	1.96E+00	7.09E+00	9.05E+47	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.13	-6.12E-01	5.42E-01	-9.05E+47	2	2.61E+00	1.36E+01	9.05E+47	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.13	-7.65E-01	4.65E-01	-9.05E+47	2	3.26E+00	2.62E+01	9.05E+47	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.13	-9.18E-01	3.99E-01	-9.05E+47	2	3.92E+00	5.03E+01	9.05E+47	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.13	-1.07E+00	3.43E-01	-9.05E+47	2	4.57E+00	9.66E+01	9.05E+47	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.13	-1.22E+00	2.94E-01	-9.05E+47	2	5.22E+00	1.86E+02	9.05E+47	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.13	-1.38E+00	2.52E-01	-9.05E+47	2	5.88E+00	3.57E+02	9.05E+47	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.13	-1.53E+00	2.17E-01	-9.05E+47	2	6.53E+00	6.85E+02	9.05E+47	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.13	-1.68E+00	1.86E-01	-9.05E+47	2	7.18E+00	1.32E+03	9.05E+47	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.13	-1.84E+00	1.59E-01	-9.05E+47	2	7.84E+00	2.53E+03	9.05E+47	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.13	-1.99E+00	1.37E-01	-9.05E+47	2	8.49E+00	4.86E+03	9.05E+47	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.13	-2.14E+00	1.17E-01	-9.05E+47	2	9.14E+00	9.34E+03	9.05E+47	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.13	-2.29E+00	1.01E-01	-9.05E+47	2	9.79E+00	1.79E+04	9.05E+47	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.13	-2.45E+00	8.65E-02	-9.05E+47	2	1.04E+01	3.45E+04	9.05E+47	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.13	-2.60E+00	7.42E-02	-9.05E+47	2	1.11E+01	6.62E+04	9.05E+47	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.13	-2.75E+00	6.37E-02	-9.05E+47	2	1.18E+01	1.27E+05	9.05E+47	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.13	-2.91E+00	5.46E-02	-9.05E+47	2	1.24E+01	2.44E+05	9.05E+47	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.13	-3.06E+00	4.69E-02	-9.05E+47	2	1.31E+01	4.70E+05	9.05E+47	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

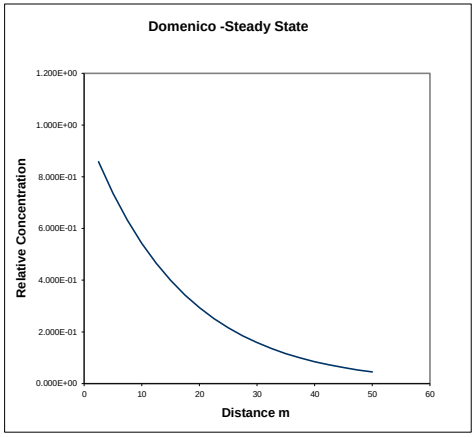
Contaminant **Xylenes**

Input	Value	Units
C_T	3.000E-02	mg/l
DF	3.077E+00	
λ	5.035E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.581E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.364E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.319E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.423E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.653E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.993E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	3.426E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.938E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.520E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	2.160E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.850E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.585E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.357E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.161E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.930E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.491E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	7.257E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	6.201E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	5.296E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	4.523E-02



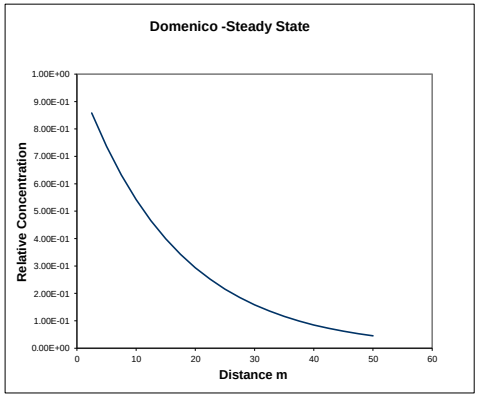
Calc **Value**

v	6.19E-01	m/d
Rc	9.83E+01	
u	6.30E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.53E-01	8.58E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.25	-3.06E-01	7.36E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.25	-4.59E-01	6.32E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.25	-6.12E-01	5.42E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.25	-7.65E-01	4.65E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.25	-9.18E-01	3.99E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.25	-1.07E+00	3.43E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.25	-1.22E+00	2.94E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.25	-1.38E+00	2.52E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.25	-1.53E+00	2.17E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.25	-1.68E+00	1.86E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.25	-1.84E+00	1.59E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.25	-1.99E+00	1.37E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.25	-2.14E+00	1.17E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.25	-2.29E+00	1.01E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.25	-2.45E+00	8.65E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.25	-2.60E+00	7.42E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.25	-2.75E+00	6.37E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.25	-2.91E+00	5.46E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.25	-3.06E+00	4.69E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	4.53E-02



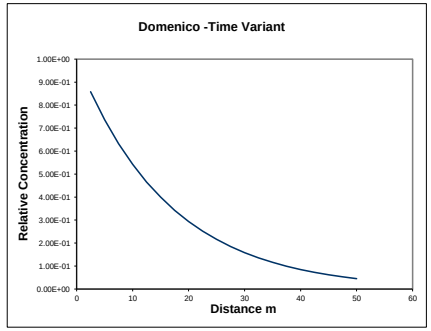
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
DF	3.0774	
λ	5.035E-04	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	4.556E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

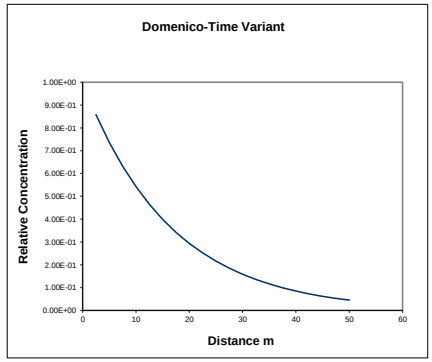
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-9.05E+47	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-9.05E+47	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-9.05E+47	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-9.05E+47	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-9.05E+47	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-9.05E+47	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-9.05E+47	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-9.05E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-9.05E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-9.05E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-9.05E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-9.05E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-9.05E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-9.05E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-9.05E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-9.05E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-9.05E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-9.05E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	6.20E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-9.05E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-9.05E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	4.52E-02



Calc	Value	
v	6.19E-01	m/d
Rc	9.83E+01	
u	6.30E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	-1.53E-01	8.58E-01	-9.05E+47	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.58E-01
2	5	0.125	-3.06E-01	7.36E-01	-9.05E+47	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.36E-01
3	7.5	0.125	-4.59E-01	6.32E-01	-9.05E+47	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	6.32E-01
4	10	0.125	-6.12E-01	5.42E-01	-9.05E+47	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.42E-01
5	12.5	0.125	-7.65E-01	4.65E-01	-9.05E+47	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.65E-01
6	15	0.125	-9.18E-01	3.99E-01	-9.05E+47	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.99E-01
7	17.5	0.125	-1.07E+00	3.43E-01	-9.05E+47	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	3.43E-01
8	20	0.125	-1.22E+00	2.94E-01	-9.05E+47	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.94E-01
9	22.5	0.125	-1.38E+00	2.52E-01	-9.05E+47	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.52E-01
10	25	0.125	-1.53E+00	2.17E-01	-9.05E+47	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	2.16E-01
11	27.5	0.125	-1.68E+00	1.86E-01	-9.05E+47	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.85E-01
12	30	0.125	-1.84E+00	1.59E-01	-9.05E+47	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.58E-01
13	32.5	0.125	-1.99E+00	1.37E-01	-9.05E+47	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.36E-01
14	35	0.125	-2.14E+00	1.17E-01	-9.05E+47	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.16E-01
15	37.5	0.125	-2.29E+00	1.01E-01	-9.05E+47	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.93E-02
16	40	0.125	-2.45E+00	8.65E-02	-9.05E+47	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.49E-02
17	42.5	0.125	-2.60E+00	7.42E-02	-9.05E+47	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	7.26E-02
18	45	0.125	-2.75E+00	6.37E-02	-9.05E+47	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	6.21E-02
19	47.5	0.125	-2.91E+00	5.46E-02	-9.05E+47	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	5.30E-02
20	50	0.125	-3.06E+00	4.69E-02	-9.05E+47	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	4.53E-02



Date:	13.07.2021
Version:	1

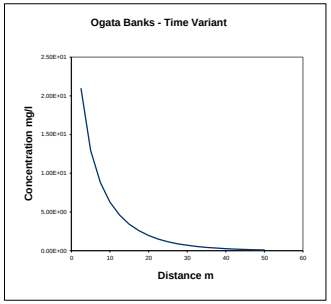
OGATA BANKS SOLUTION

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

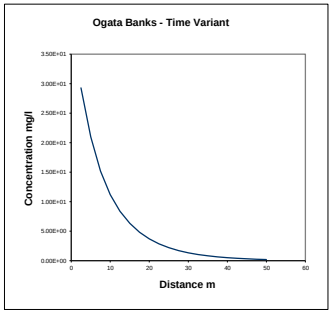
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	4.725	-2.1E-01	8.1E-01	-2.7E+48	2.000	7.1E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	2.09E+01
2	5	4.725	-4.2E-01	6.6E-01	-2.7E+48	2.000	1.4E+00	4.1E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.30E+01
3	7.5	4.725	-6.3E-01	5.3E-01	-2.7E+48	2.000	2.1E+00	8.4E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	8.82E+00
4	10	4.725	-8.4E-01	4.3E-01	-2.7E+48	2.000	2.8E+00	1.7E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	6.28E+00
5	12.5	4.725	-1.0E+00	3.5E-01	-2.7E+48	2.000	3.5E+00	3.5E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	4.59E+00
6	15	4.725	-1.3E+00	2.9E-01	-2.7E+48	2.000	4.3E+00	7.0E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	3.42E+00
7	17.5	4.725	-1.5E+00	2.3E-01	-2.7E+48	2.000	5.0E+00	1.4E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	2.58E+00
8	20	4.725	-1.7E+00	1.9E-01	-2.7E+48	2.000	5.7E+00	2.9E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	1.96E+00
9	22.5	4.725	-1.9E+00	1.5E-01	-2.7E+48	2.000	6.4E+00	5.9E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	1.50E+00
10	25	4.725	-2.1E+00	1.2E-01	-2.7E+48	2.000	7.1E+00	1.2E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.16E+00
11	27.5	4.725	-2.3E+00	1.0E-01	-2.7E+48	2.000	7.8E+00	2.4E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	8.97E-01
12	30	4.725	-2.5E+00	8.2E-02	-2.7E+48	2.000	8.5E+00	4.9E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	6.97E-01
13	32.5	4.725	-2.7E+00	6.6E-02	-2.7E+48	2.000	9.2E+00	1.0E+04	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	5.42E-01
14	35	4.725	-2.9E+00	5.4E-02	-2.7E+48	2.000	9.9E+00	2.0E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	4.23E-01
15	37.5	4.725	-3.1E+00	4.4E-02	-2.7E+48	2.000	1.1E+01	4.1E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	3.31E-01
16	40	4.725	-3.3E+00	3.5E-02	-2.7E+48	2.000	1.1E+01	8.4E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	2.60E-01
17	42.5	4.725	-3.5E+00	2.9E-02	-2.7E+48	2.000	1.2E+01	1.7E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	2.04E-01
18	45	4.725	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	3.5E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.60E-01
19	47.5	4.725	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.3E+01	7.1E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.26E-01
20	50	4.725	-4.2E+00	1.5E-02	-2.7E+48	2.000	1.4E+01	1.4E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	9.92E-02



Calc	Value	
v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	4.725	-2.1E-01	8.1E-01	-2.7E+48	2.000	7.1E-01	2.0E+00	2.7E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	2.93E+01
2	5	4.725	-4.2E-01	6.6E-01	-2.7E+48	2.000	1.4E+00	4.1E+00	2.7E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	2.10E+01
3	7.5	4.725	-6.3E-01	5.3E-01	-2.7E+48	2.000	2.1E+00	8.4E+00	2.7E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.52E+01
4	10	4.725	-8.4E-01	4.3E-01	-2.7E+48	2.000	2.8E+00	1.7E+01	2.7E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.12E+01
5	12.5	4.725	-1.0E+00	3.5E-01	-2.7E+48	2.000	3.5E+00	3.5E+01	2.7E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	8.37E+00
6	15	4.725	-1.3E+00	2.9E-01	-2.7E+48	2.000	4.3E+00	7.0E+01	2.7E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	6.33E+00
7	17.5	4.725	-1.5E+00	2.3E-01	-2.7E+48	2.000	5.0E+00	1.4E+02	2.7E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	4.82E+00
8	20	4.725	-1.7E+00	1.9E-01	-2.7E+48	2.000	5.7E+00	2.9E+02	2.7E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	3.70E+00
9	22.5	4.725	-1.9E+00	1.5E-01	-2.7E+48	2.000	6.4E+00	5.9E+02	2.7E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	2.85E+00
10	25	4.725	-2.1E+00	1.2E-01	-2.7E+48	2.000	7.1E+00	1.2E+03	2.7E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	2.21E+00
11	27.5	4.725	-2.3E+00	1.0E-01	-2.7E+48	2.000	7.8E+00	2.4E+03	2.7E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.72E+00
12	30	4.725	-2.5E+00	8.2E-02	-2.7E+48	2.000	8.5E+00	4.9E+03	2.7E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.34E+00
13	32.5	4.725	-2.7E+00	6.6E-02	-2.7E+48	2.000	9.2E+00	1.0E+04	2.7E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	1.04E+00
14	35	4.725	-2.9E+00	5.4E-02	-2.7E+48	2.000	9.9E+00	2.0E+04	2.7E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	8.18E-01
15	37.5	4.725	-3.1E+00	4.4E-02	-2.7E+48	2.000	1.1E+01	4.1E+04	2.7E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	6.41E-01
16	40	4.725	-3.3E+00	3.5E-02	-2.7E+48	2.000	1.1E+01	8.4E+04	2.7E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	5.03E-01
17	42.5	4.725	-3.5E+00	2.9E-02	-2.7E+48	2.000	1.2E+01	1.7E+05	2.7E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	3.96E-01
18	45	4.725	-3.8E+00	2.3E-02	-2.7E+48	2.000	1.3E+01	3.5E+05	2.7E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.12E-01
19	47.5	4.725	-4.0E+00	1.9E-02	-2.7E+48	2.000	1.3E+01	7.1E+05	2.7E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	2.46E-01
20	50	4.725	-4.2E+00	1.5E-02	-2.7E+48	2.000	1.4E+01	1.4E+06	2.7E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	1.94E-01



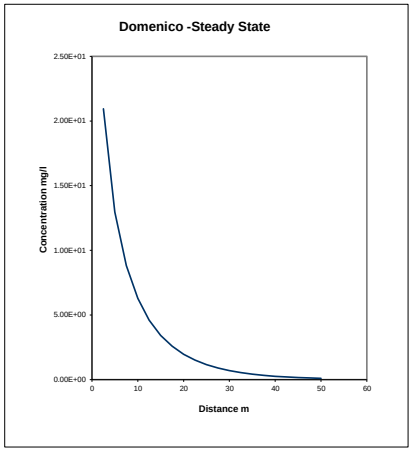
Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Contaminant	Xylenes	
Input	**Value**	**Units**
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	9.45	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	2.09E+01
2	5	9.45	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.30E+01
3	7.5	9.45	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	8.82E+00
4	10	9.45	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	6.28E+00
5	12.5	9.45	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	4.59E+00
6	15	9.45	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	3.42E+00
7	17.5	9.45	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	2.58E+00
8	20	9.45	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	1.96E+00
9	22.5	9.45	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	1.50E+00
10	25	9.45	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.16E+00
11	27.5	9.45	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	8.97E-01
12	30	9.45	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	6.97E-01
13	32.5	9.45	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	5.42E-01
14	35	9.45	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	4.23E-01
15	37.5	9.45	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	3.31E-01
16	40	9.45	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	2.60E-01
17	42.5	9.45	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	2.04E-01
18	45	9.45	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.60E-01
19	47.5	9.45	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.26E-01
20	50	9.45	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	9.92E-02



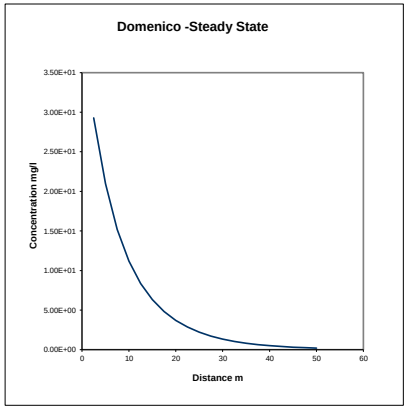
Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	9.45	-2.09E-01	8.12E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	2.93E+01
2	5	9.45	-4.18E-01	6.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	2.10E+01
3	7.5	9.45	-6.26E-01	5.35E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.52E+01
4	10	9.45	-8.35E-01	4.34E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.12E+01
5	12.5	9.45	-1.04E+00	3.52E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	8.37E+00
6	15	9.45	-1.25E+00	2.86E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	6.33E+00
7	17.5	9.45	-1.46E+00	2.32E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	4.82E+00
8	20	9.45	-1.67E+00	1.88E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	3.70E+00
9	22.5	9.45	-1.88E+00	1.53E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	2.85E+00
10	25	9.45	-2.09E+00	1.24E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	2.21E+00
11	27.5	9.45	-2.30E+00	1.01E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.72E+00
12	30	9.45	-2.51E+00	8.16E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.34E+00
13	32.5	9.45	-2.71E+00	6.62E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	1.04E+00
14	35	9.45	-2.92E+00	5.38E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	8.18E-01
15	37.5	9.45	-3.13E+00	4.36E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	6.41E-01
16	40	9.45	-3.34E+00	3.54E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	5.03E-01
17	42.5	9.45	-3.55E+00	2.87E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	3.96E-01
18	45	9.45	-3.76E+00	2.33E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.12E-01
19	47.5	9.45	-3.97E+00	1.89E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	2.46E-01
20	50	9.45	-4.18E+00	1.54E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	1.94E-01



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

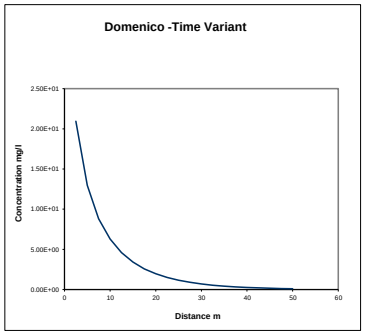
Contaminant **Xylenes**

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Input	Value	Units
C_T	0.03	mg/l
Co	3.78E+01	mg/l
λ	5.04E-04	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	4.56E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	4.725	-2.09E-01	8.12E-01	-2.68E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	2.09E+01
2	5	4.725	-4.18E-01	6.59E-01	-2.68E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.30E+01
3	7.5	4.725	-6.26E-01	5.35E-01	-2.68E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	8.82E+00
4	10	4.725	-8.35E-01	4.34E-01	-2.68E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	6.28E+00
5	12.5	4.725	-1.04E+00	3.52E-01	-2.68E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	4.59E+00
6	15	4.725	-1.25E+00	2.86E-01	-2.68E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	3.42E+00
7	17.5	4.725	-1.46E+00	2.32E-01	-2.68E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	2.58E+00
8	20	4.725	-1.67E+00	1.88E-01	-2.68E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	1.96E+00
9	22.5	4.725	-1.88E+00	1.53E-01	-2.68E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	1.50E+00
10	25	4.725	-2.09E+00	1.24E-01	-2.68E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.16E+00
11	27.5	4.725	-2.30E+00	1.01E-01	-2.68E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	8.97E-01
12	30	4.725	-2.51E+00	8.16E-02	-2.68E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	6.97E-01
13	32.5	4.725	-2.71E+00	6.62E-02	-2.68E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	5.42E-01
14	35	4.725	-2.92E+00	5.38E-02	-2.68E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	4.23E-01
15	37.5	4.725	-3.13E+00	4.36E-02	-2.68E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	3.31E-01
16	40	4.725	-3.34E+00	3.54E-02	-2.68E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	2.60E-01
17	42.5	4.725	-3.55E+00	2.87E-02	-2.68E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	2.04E-01
18	45	4.725	-3.76E+00	2.33E-02	-2.68E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.60E-01
19	47.5	4.725	-3.97E+00	1.89E-02	-2.68E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.26E-01
20	50	4.725	-4.18E+00	1.54E-02	-2.68E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	9.92E-02

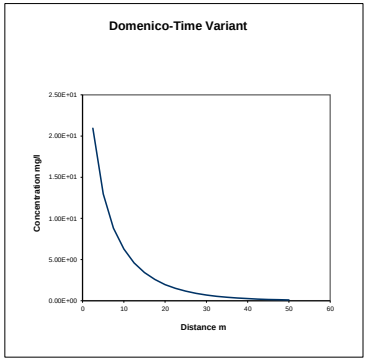


Calc **Value**

v	4.18E-01	m/d
Rc	9.83E+01	
u	4.25E-03	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	4.725	-2.09E-01	8.12E-01	-2.68E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	2.93E+01
2	5	4.725	-4.18E-01	6.59E-01	-2.68E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	2.10E+01
3	7.5	4.725	-6.26E-01	5.35E-01	-2.68E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.52E+01
4	10	4.725	-8.35E-01	4.34E-01	-2.68E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.12E+01
5	12.5	4.725	-1.04E+00	3.52E-01	-2.68E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	8.37E+00
6	15	4.725	-1.25E+00	2.86E-01	-2.68E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	6.33E+00
7	17.5	4.725	-1.46E+00	2.32E-01	-2.68E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	4.82E+00
8	20	4.725	-1.67E+00	1.88E-01	-2.68E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	3.70E+00
9	22.5	4.725	-1.88E+00	1.53E-01	-2.68E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	2.85E+00
10	25	4.725	-2.09E+00	1.24E-01	-2.68E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	2.21E+00
11	27.5	4.725	-2.30E+00	1.01E-01	-2.68E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.72E+00
12	30	4.725	-2.51E+00	8.16E-02	-2.68E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.34E+00
13	32.5	4.725	-2.71E+00	6.62E-02	-2.68E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	1.04E+00
14	35	4.725	-2.92E+00	5.38E-02	-2.68E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	8.18E-01
15	37.5	4.725	-3.13E+00	4.36E-02	-2.68E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	6.41E-01
16	40	4.725	-3.34E+00	3.54E-02	-2.68E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	5.03E-01
17	42.5	4.725	-3.55E+00	2.87E-02	-2.68E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	3.96E-01
18	45	4.725	-3.76E+00	2.33E-02	-2.68E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.12E-01
19	47.5	4.725	-3.97E+00	1.89E-02	-2.68E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	2.46E-01
20	50	4.725	-4.18E+00	1.54E-02	-2.68E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	1.94E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Tolune			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	2.00E+00	days	R2174c-R10-App A
Calculated decay rate	λ	3.47E-01	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	3.47E-01	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.76E-06	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.66E+05**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**6.06E+04**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.23E+05	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**3.76E-06**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	0.00E+00	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

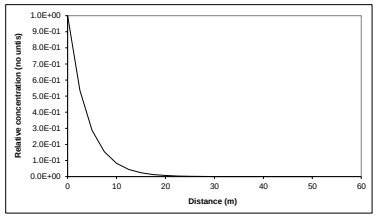
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	5.36E-01	4.62E+00
5.0	2.88E-01	2.48E+00
7.5	1.54E-01	1.33E+00
10.0	8.28E-02	7.13E-01
12.5	4.44E-02	3.82E-01
15.0	2.38E-02	2.05E-01
17.5	1.28E-02	1.10E-01
20.0	6.85E-03	5.90E-02
22.5	3.67E-03	3.16E-02
25.0	1.97E-03	1.69E-02
27.5	1.05E-03	9.07E-03
30.0	5.64E-04	4.86E-03
32.5	3.02E-04	2.60E-03
35.0	1.62E-04	1.39E-03
37.5	8.64E-05	7.43E-04
40.0	4.62E-05	3.97E-04
42.5	2.47E-05	2.12E-04
45.0	1.32E-05	1.13E-04
47.5	7.04E-06	6.06E-05
50.0	3.76E-06	3.24E-05

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

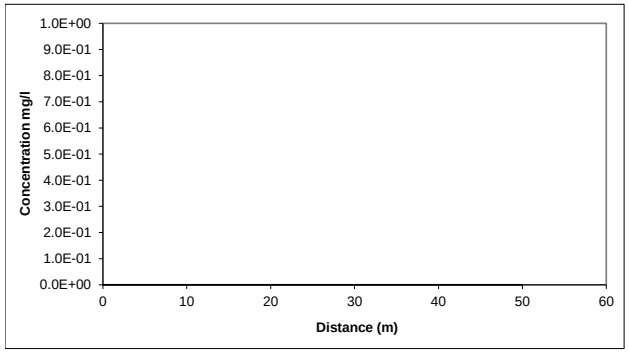
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.66E+05

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	2.00E+00	days	R2174c-R10-App A
Calculated decay rate	λ	3.47E-01	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	8.35E-03	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	6.86E-06	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**2.56E+07**	

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

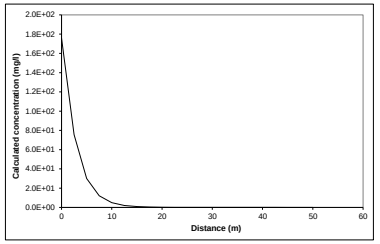
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	7.55E+01
5.0	3.00E+01
7.5	1.21E+01
10.0	4.93E+00
12.5	2.04E+00
15.0	8.57E-01
17.5	3.62E-01
20.0	1.54E-01
22.5	6.60E-02
25.0	2.84E-02
27.5	1.22E-02
30.0	5.28E-03
32.5	2.29E-03
35.0	9.94E-04
37.5	4.32E-04
40.0	1.88E-04
42.5	8.21E-05
45.0	3.58E-05
47.5	1.57E-05
50.0	6.86E-06

Site being assessed:	Tetrosyl		
Completed by:	BJT		
Date:	13.07.2021		
Version:	1		

Remedial Targets

Remedial Target		**1.90E+06**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**6.86E-06**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Tolune**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			1.90E+00	l/kg

Calculated Remedial Target	**1.51E-01**	**mg/kg**	**for**	**Tolune**

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

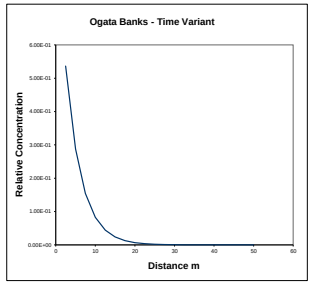
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	3.466E-01	days^{-1}
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

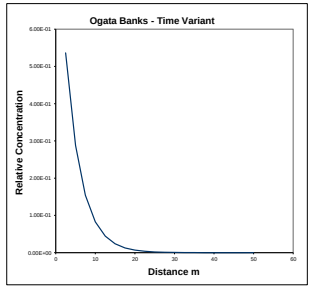
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.23E-01	5.36E-01	-1.94E+49	2	1.12E+00	3.07E+00	1.94E+49	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.36E-01
2	5	0.13	-1.25E+00	2.88E-01	-1.94E+49	2	2.25E+00	9.45E+00	1.94E+49	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.88E-01
3	7.5	0.13	-1.87E+00	1.54E-01	-1.94E+49	2	3.37E+00	2.90E+01	1.94E+49	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.54E-01
4	10	0.13	-2.49E+00	8.28E-02	-1.94E+49	2	4.49E+00	8.92E+01	1.94E+49	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.28E-02
5	12.5	0.13	-3.11E+00	4.44E-02	-1.94E+49	2	5.61E+00	2.74E+02	1.94E+49	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.44E-02
6	15	0.13	-3.74E+00	2.38E-02	-1.94E+49	2	6.74E+00	8.43E+02	1.94E+49	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	2.38E-02
7	17.5	0.13	-4.36E+00	1.28E-02	-1.94E+49	2	7.86E+00	2.59E+03	1.94E+49	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	1.28E-02
8	20	0.13	-4.98E+00	6.86E-03	-1.94E+49	2	8.98E+00	7.96E+03	1.94E+49	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.85E-03
9	22.5	0.13	-5.61E+00	3.68E-03	-1.94E+49	2	1.01E+01	2.45E+04	1.94E+49	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	3.67E-03
10	25	0.13	-6.23E+00	1.97E-03	-1.94E+49	2	1.12E+01	7.52E+04	1.94E+49	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	1.97E-03
11	27.5	0.13	-6.85E+00	1.06E-03	-1.94E+49	2	1.24E+01	2.31E+05	1.94E+49	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.05E-03
12	30	0.13	-7.47E+00	5.68E-04	-1.94E+49	2	1.35E+01	7.11E+05	1.94E+49	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	5.64E-04
13	32.5	0.13	-8.10E+00	3.05E-04	-1.94E+49	2	1.46E+01	2.18E+06	1.94E+49	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	3.02E-04
14	35	0.13	-8.72E+00	1.63E-04	-1.94E+49	2	1.57E+01	6.71E+06	1.94E+49	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.61E-04
15	37.5	0.13	-9.34E+00	8.76E-05	-1.94E+49	2	1.68E+01	2.06E+07	1.94E+49	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	8.64E-05
16	40	0.13	-9.97E+00	4.70E-05	-1.94E+49	2	1.80E+01	6.34E+07	1.94E+49	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	4.62E-05
17	42.5	0.13	-1.06E+01	2.52E-05	-1.94E+49	2	1.91E+01	1.95E+08	1.94E+49	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	2.47E-05
18	45	0.13	-1.12E+01	1.35E-05	-1.94E+49	2	2.02E+01	5.99E+08	1.94E+49	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	1.32E-05
19	47.5	0.13	-1.18E+01	7.26E-06	-1.94E+49	2	2.13E+01	1.84E+09	1.94E+49	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	7.03E-06
20	50	0.13	-1.25E+01	3.89E-06	-1.94E+49	2	2.25E+01	5.66E+09	1.94E+49	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	3.75E-06



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.23E-01	5.36E-01	-1.94E+49	2	1.12E+00	3.07E+00	1.94E+49	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
2	5	0.13	-1.25E+00	2.88E-01	-1.94E+49	2	2.25E+00	9.45E+00	1.94E+49	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
3	7.5	0.13	-1.87E+00	1.54E-01	-1.94E+49	2	3.37E+00	2.90E+01	1.94E+49	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
4	10	0.13	-2.49E+00	8.28E-02	-1.94E+49	2	4.49E+00	8.92E+01	1.94E+49	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
5	12.5	0.13	-3.11E+00	4.44E-02	-1.94E+49	2	5.61E+00	2.74E+02	1.94E+49	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.44E-02
6	15	0.13	-3.74E+00	2.38E-02	-1.94E+49	2	6.74E+00	8.43E+02	1.94E+49	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	2.38E-02
7	17.5	0.13	-4.36E+00	1.28E-02	-1.94E+49	2	7.86E+00	2.59E+03	1.94E+49	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	1.28E-02
8	20	0.13	-4.98E+00	6.86E-03	-1.94E+49	2	8.98E+00	7.96E+03	1.94E+49	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.85E-03
9	22.5	0.13	-5.61E+00	3.68E-03	-1.94E+49	2	1.01E+01	2.45E+04	1.94E+49	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	3.67E-03
10	25	0.13	-6.23E+00	1.97E-03	-1.94E+49	2	1.12E+01	7.52E+04	1.94E+49	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.97E-03
11	27.5	0.13	-6.85E+00	1.06E-03	-1.94E+49	2	1.24E+01	2.31E+05	1.94E+49	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.05E-03
12	30	0.13	-7.47E+00	5.68E-04	-1.94E+49	2	1.35E+01	7.11E+05	1.94E+49	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	5.64E-04
13	32.5	0.13	-8.10E+00	3.05E-04	-1.94E+49	2	1.46E+01	2.18E+06	1.94E+49	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	3.02E-04
14	35	0.13	-8.72E+00	1.63E-04	-1.94E+49	2	1.57E+01	6.71E+06	1.94E+49	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.62E-04
15	37.5	0.13	-9.34E+00	8.76E-05	-1.94E+49	2	1.68E+01	2.06E+07	1.94E+49	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	8.64E-05
16	40	0.13	-9.97E+00	4.70E-05	-1.94E+49	2	1.80E+01	6.34E+07	1.94E+49	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	4.62E-05
17	42.5	0.13	-1.06E+01	2.52E-05	-1.94E+49	2	1.91E+01	1.95E+08	1.94E+49	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	2.47E-05
18	45	0.13	-1.12E+01	1.35E-05	-1.94E+49	2	2.02E+01	5.99E+08	1.94E+49	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	1.32E-05
19	47.5	0.13	-1.18E+01	7.26E-06	-1.94E+49	2	2.13E+01	1.84E+09	1.94E+49	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	7.04E-06
20	50	0.13	-1.25E+01	3.89E-06	-1.94E+49	2	2.25E+01	5.66E+09	1.94E+49	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	3.76E-06



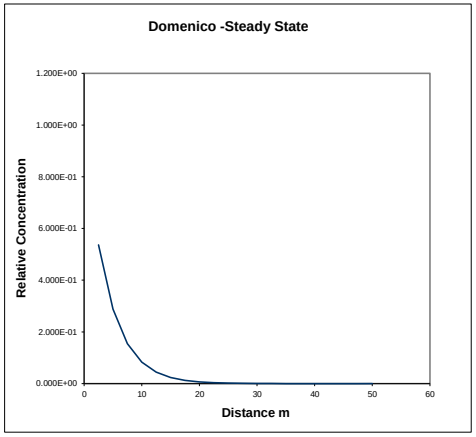
Date:	13.07.2021
Version:	1

Contaminant	Toluene	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	3.466E-01	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.23E-01	5.36E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.364E-01
2	5	0.25	-1.25E+00	2.88E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.878E-01
3	7.5	0.25	-1.87E+00	1.54E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.544E-01
4	10	0.25	-2.49E+00	8.28E-02	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.280E-02
5	12.5	0.25	-3.11E+00	4.44E-02	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.442E-02
6	15	0.25	-3.74E+00	2.38E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	2.382E-02
7	17.5	0.25	-4.36E+00	1.28E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	1.278E-02
8	20	0.25	-4.98E+00	6.86E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.851E-03
9	22.5	0.25	-5.61E+00	3.68E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	3.672E-03
10	25	0.25	-6.23E+00	1.97E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	1.968E-03
11	27.5	0.25	-6.85E+00	1.06E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.054E-03
12	30	0.25	-7.47E+00	5.68E-04	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	5.642E-04
13	32.5	0.25	-8.10E+00	3.05E-04	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	3.019E-04
14	35	0.25	-8.72E+00	1.63E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.615E-04
15	37.5	0.25	-9.34E+00	8.76E-05	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	8.635E-05
16	40	0.25	-9.97E+00	4.70E-05	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	4.615E-05
17	42.5	0.25	-1.06E+01	2.52E-05	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	2.466E-05
18	45	0.25	-1.12E+01	1.35E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	1.317E-05
19	47.5	0.25	-1.18E+01	7.26E-06	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	7.033E-06
20	50	0.25	-1.25E+01	3.89E-06	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	3.754E-06

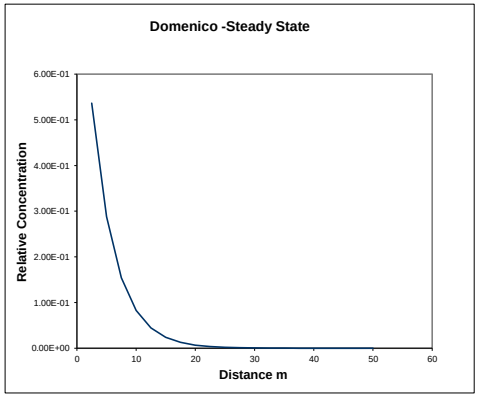


Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

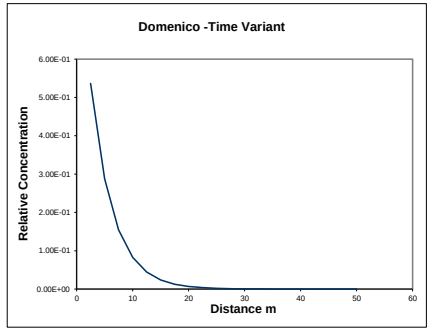
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.23E-01	5.36E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
2	5	0.25	-1.25E+00	2.88E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
3	7.5	0.25	-1.87E+00	1.54E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
4	10	0.25	-2.49E+00	8.28E-02	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
5	12.5	0.25	-3.11E+00	4.44E-02	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.44E-02
6	15	0.25	-3.74E+00	2.38E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	2.38E-02
7	17.5	0.25	-4.36E+00	1.28E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	1.28E-02
8	20	0.25	-4.98E+00	6.86E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.85E-03
9	22.5	0.25	-5.61E+00	3.68E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	3.67E-03
10	25	0.25	-6.23E+00	1.97E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.97E-03
11	27.5	0.25	-6.85E+00	1.06E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.05E-03
12	30	0.25	-7.47E+00	5.68E-04	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	5.64E-04
13	32.5	0.25	-8.10E+00	3.05E-04	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	3.02E-04
14	35	0.25	-8.72E+00	1.63E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.62E-04
15	37.5	0.25	-9.34E+00	8.76E-05	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	8.64E-05
16	40	0.25	-9.97E+00	4.70E-05	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	4.62E-05
17	42.5	0.25	-1.06E+01	2.52E-05	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	2.47E-05
18	45	0.25	-1.12E+01	1.35E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	1.32E-05
19	47.5	0.25	-1.18E+01	7.26E-06	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	7.04E-06
20	50	0.25	-1.25E+01	3.89E-06	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	3.76E-06



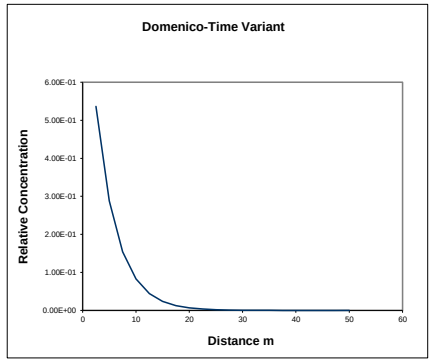
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Tolune																
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	0.125	-6.23E-01	5.36E-01	-1.94E+49	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.36E-01
DF	3.0774		2	5	0.125	-1.25E+00	2.88E-01	-1.94E+49	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.88E-01
			3	7.5	0.125	-1.87E+00	1.54E-01	-1.94E+49	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.54E-01
			4	10	0.125	-2.49E+00	8.28E-02	-1.94E+49	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.28E-02
λ	3.466E-01	$days^{-1}$	5	12.5	0.125	-3.11E+00	4.44E-02	-1.94E+49	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.44E-02
Sz	3.000E+01	m	6	15	0.125	-3.74E+00	2.38E-02	-1.94E+49	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	2.38E-02
Sy	1.400E+01	m	7	17.5	0.125	-4.36E+00	1.28E-02	-1.94E+49	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	1.28E-02
Kd	0.000E+00	l/kg	8	20	0.125	-4.98E+00	6.86E-03	-1.94E+49	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	6.85E-03
ρ	2.350E+00	g/cm3	9	22.5	0.125	-5.61E+00	3.68E-03	-1.94E+49	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	3.67E-03
n	1.100E-01		10	25	0.125	-6.23E+00	1.97E-03	-1.94E+49	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	1.97E-03
i	5.925E-02		11	27.5	0.125	-6.85E+00	1.06E-03	-1.94E+49	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.05E-03
K	1.150E+00	m/d	12	30	0.125	-7.47E+00	5.68E-04	-1.94E+49	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	5.64E-04
x	5.000E+01	m	13	32.5	0.125	-8.10E+00	3.05E-04	-1.94E+49	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	3.02E-04
z	0.000E+00	m	14	35	0.125	-8.72E+00	1.63E-04	-1.94E+49	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.61E-04
y	0.000E+00	m	15	37.5	0.125	-9.34E+00	8.76E-05	-1.94E+49	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	8.64E-05
t	1.000E+99	days	16	40	0.125	-9.97E+00	4.70E-05	-1.94E+49	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	4.62E-05
ax	5.000E+00	m	17	42.5	0.125	-1.06E+01	2.52E-05	-1.94E+49	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	2.47E-05
az	5.000E-01	m	18	45	0.125	-1.12E+01	1.35E-05	-1.94E+49	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	1.32E-05
ay	5.000E-02	m	19	47.5	0.125	-1.18E+01	7.26E-06	-1.94E+49	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	7.03E-06
			20	50	0.125	-1.25E+01	3.89E-06	-1.94E+49	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	3.75E-06



Calc	Value																
			Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
v	6.19E-01	m/d		m														
Rc	1.00E+00		1	2.5	0.125	-6.23E-01	5.36E-01	-1.94E+49	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
u	6.19E-01	m/d	2	5	0.125	-1.25E+00	2.88E-01	-1.94E+49	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
			3	7.5	0.125	-1.87E+00	1.54E-01	-1.94E+49	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
			4	10	0.125	-2.49E+00	8.28E-02	-1.94E+49	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
			5	12.5	0.125	-3.11E+00	4.44E-02	-1.94E+49	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.44E-02
			6	15	0.125	-3.74E+00	2.38E-02	-1.94E+49	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	2.38E-02
			7	17.5	0.125	-4.36E+00	1.28E-02	-1.94E+49	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	1.28E-02
			8	20	0.125	-4.98E+00	6.86E-03	-1.94E+49	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	6.85E-03
			9	22.5	0.125	-5.61E+00	3.68E-03	-1.94E+49	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	3.67E-03
			10	25	0.125	-6.23E+00	1.97E-03	-1.94E+49	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	1.97E-03
			11	27.5	0.125	-6.85E+00	1.06E-03	-1.94E+49	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.05E-03
			12	30	0.125	-7.47E+00	5.68E-04	-1.94E+49	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	5.64E-04
			13	32.5	0.125	-8.10E+00	3.05E-04	-1.94E+49	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	3.02E-04
			14	35	0.125	-8.72E+00	1.63E-04	-1.94E+49	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.62E-04
			15	37.5	0.125	-9.34E+00	8.76E-05	-1.94E+49	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	8.64E-05
			16	40	0.125	-9.97E+00	4.70E-05	-1.94E+49	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	4.62E-05
			17	42.5	0.125	-1.06E+01	2.52E-05	-1.94E+49	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	2.47E-05
			18	45	0.125	-1.12E+01	1.35E-05	-1.94E+49	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	1.32E-05
			19	47.5	0.125	-1.18E+01	7.26E-06	-1.94E+49	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	7.04E-06
			20	50	0.125	-1.25E+01	3.89E-06	-1.94E+49	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	3.76E-06



Date:	13.07.2021
Version:	1

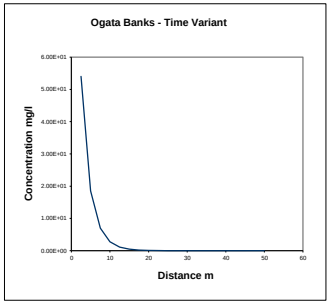
OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	8.35E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

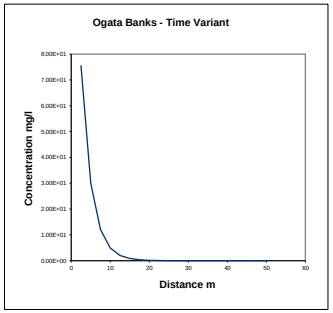
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-8.0E-01	4.5E-01	-9.4E+48	2.000	1.3E+00	3.7E+00	9.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	5.40E+01
2	5	21.975	-1.6E+00	2.0E-01	-9.4E+48	2.000	2.6E+00	1.3E+01	9.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	1.85E+01
3	7.5	21.975	-2.4E+00	9.1E-02	-9.4E+48	2.000	3.9E+00	4.9E+01	9.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	7.00E+00
4	10	21.975	-3.2E+00	4.1E-02	-9.4E+48	2.000	5.2E+00	1.8E+02	9.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	2.77E+00
5	12.5	21.975	-4.0E+00	1.8E-02	-9.4E+48	2.000	6.5E+00	6.6E+02	9.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.12E+00
6	15	21.975	-4.8E+00	8.3E-03	-9.4E+48	2.000	7.8E+00	2.4E+03	9.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	4.64E-01
7	17.5	21.975	-5.6E+00	3.7E-03	-9.4E+48	2.000	9.1E+00	8.8E+03	9.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.94E-01
8	20	21.975	-6.4E+00	1.7E-03	-9.4E+48	2.000	1.0E+01	3.2E+04	9.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	8.19E-02
9	22.5	21.975	-7.2E+00	7.6E-04	-9.4E+48	2.000	1.2E+01	1.2E+05	9.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	3.48E-02
10	25	21.975	-8.0E+00	3.4E-04	-9.4E+48	2.000	1.3E+01	4.3E+05	9.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	1.49E-02
11	27.5	21.975	-8.8E+00	1.5E-04	-9.4E+48	2.000	1.4E+01	1.6E+06	9.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	6.39E-03
12	30	21.975	-9.6E+00	6.9E-05	-9.4E+48	2.000	1.6E+01	5.8E+06	9.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.75E-03
13	32.5	21.975	-1.0E+01	3.1E-05	-9.4E+48	2.000	1.7E+01	2.1E+07	9.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.19E-03
14	35	21.975	-1.1E+01	1.4E-05	-9.4E+48	2.000	1.8E+01	7.8E+07	9.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	5.14E-04
15	37.5	21.975	-1.2E+01	6.3E-06	-9.4E+48	2.000	1.9E+01	2.9E+08	9.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	2.23E-04
16	40	21.975	-1.3E+01	2.8E-06	-9.4E+48	2.000	2.1E+01	1.0E+09	9.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	9.70E-05
17	42.5	21.975	-1.4E+01	1.3E-06	-9.4E+48	2.000	2.2E+01	3.8E+09	9.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	4.22E-05
18	45	21.975	-1.4E+01	5.8E-07	-9.4E+48	2.000	2.3E+01	1.4E+10	9.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	1.84E-05
19	47.5	21.975	-1.5E+01	2.6E-07	-9.4E+48	2.000	2.5E+01	5.1E+10	9.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	8.04E-06
20	50	21.975	-1.6E+01	1.2E-07	-9.4E+48	2.000	2.6E+01	1.9E+11	9.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.51E-06



Calc	**Value**	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-8.0E-01	4.5E-01	-9.4E+48	2.000	1.3E+00	3.7E+00	9.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	7.55E+01
2	5	21.975	-1.6E+00	2.0E-01	-9.4E+48	2.000	2.6E+00	1.3E+01	9.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	3.00E+01
3	7.5	21.975	-2.4E+00	9.1E-02	-9.4E+48	2.000	3.9E+00	4.9E+01	9.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.21E+01
4	10	21.975	-3.2E+00	4.1E-02	-9.4E+48	2.000	5.2E+00	1.8E+02	9.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	4.93E+00
5	12.5	21.975	-4.0E+00	1.8E-02	-9.4E+48	2.000	6.5E+00	6.6E+02	9.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	2.04E+00
6	15	21.975	-4.8E+00	8.3E-03	-9.4E+48	2.000	7.8E+00	2.4E+03	9.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	8.57E-01
7	17.5	21.975	-5.6E+00	3.7E-03	-9.4E+48	2.000	9.1E+00	8.8E+03	9.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	3.62E-01
8	20	21.975	-6.4E+00	1.7E-03	-9.4E+48	2.000	1.0E+01	3.2E+04	9.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.54E-01
9	22.5	21.975	-7.2E+00	7.6E-04	-9.4E+48	2.000	1.2E+01	1.2E+05	9.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	6.60E-02
10	25	21.975	-8.0E+00	3.4E-04	-9.4E+48	2.000	1.3E+01	4.3E+05	9.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	2.84E-02
11	27.5	21.975	-8.8E+00	1.5E-04	-9.4E+48	2.000	1.4E+01	1.6E+06	9.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	1.22E-02
12	30	21.975	-9.6E+00	6.9E-05	-9.4E+48	2.000	1.6E+01	5.8E+06	9.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	5.28E-03
13	32.5	21.975	-1.0E+01	3.1E-05	-9.4E+48	2.000	1.7E+01	2.1E+07	9.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	2.29E-03
14	35	21.975	-1.1E+01	1.4E-05	-9.4E+48	2.000	1.8E+01	7.8E+07	9.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	9.94E-04
15	37.5	21.975	-1.2E+01	6.3E-06	-9.4E+48	2.000	1.9E+01	2.9E+08	9.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	4.32E-04
16	40	21.975	-1.3E+01	2.8E-06	-9.4E+48	2.000	2.1E+01	1.0E+09	9.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.88E-04
17	42.5	21.975	-1.4E+01	1.3E-06	-9.4E+48	2.000	2.2E+01	3.8E+09	9.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	8.21E-05
18	45	21.975	-1.4E+01	5.8E-07	-9.4E+48	2.000	2.3E+01	1.4E+10	9.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	3.58E-05
19	47.5	21.975	-1.5E+01	2.6E-07	-9.4E+48	2.000	2.5E+01	5.1E+10	9.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	1.57E-05
20	50	21.975	-1.6E+01	1.2E-07	-9.4E+48	2.000	2.6E+01	1.9E+11	9.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	6.86E-06

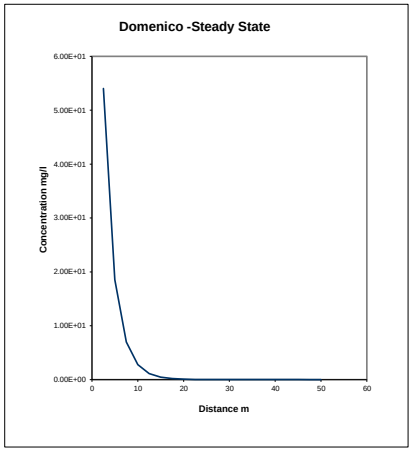


Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

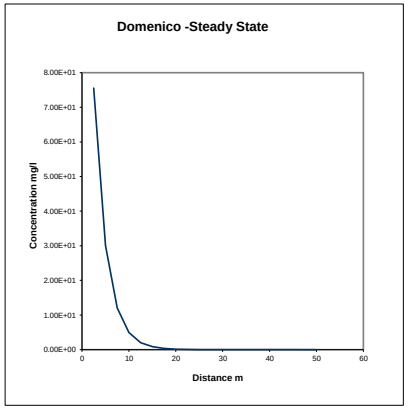
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Tolune			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
Input	**Value**	**Units**														
C_T	0.074	mg/l	1	2.5	43.95	-7.98E-01	4.50E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	5.40E+01
			2	5	43.95	-1.60E+00	2.03E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	1.85E+01
			3	7.5	43.95	-2.39E+00	9.12E-02	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	7.00E+00
Co	1.76E+02	mg/l	4	10	43.95	-3.19E+00	4.11E-02	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	2.77E+00
λ	8.35E-03	$days^{-1}$	5	12.5	43.95	-3.99E+00	1.85E-02	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.12E+00
Sz	3.00E+01	m	6	15	43.95	-4.79E+00	8.32E-03	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	4.64E-01
Sy	1.00E+00	m	7	17.5	43.95	-5.59E+00	3.75E-03	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.94E-01
Kd	1.90E+00	l/kg	8	20	43.95	-6.38E+00	1.69E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	8.19E-02
ρ	2.35E+00	g/cm3	9	22.5	43.95	-7.18E+00	7.60E-04	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	3.48E-02
n	1.10E-01		10	25	43.95	-7.98E+00	3.42E-04	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	1.49E-02
i	4.00E-02		11	27.5	43.95	-8.78E+00	1.54E-04	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	6.39E-03
K	1.15E+00	m/d	12	30	43.95	-9.58E+00	6.93E-05	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.75E-03
x	5.00E+01	m	13	32.5	43.95	-1.04E+01	3.12E-05	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.19E-03
z	0.00E+00	m	14	35	43.95	-1.12E+01	1.40E-05	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	5.14E-04
y	0.00E+00	m	15	37.5	43.95	-1.20E+01	6.32E-06	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	2.23E-04
			16	40	43.95	-1.28E+01	2.85E-06	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	9.70E-05
ax	5.00E+00	m	17	42.5	43.95	-1.36E+01	1.28E-06	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	4.22E-05
az	5.00E-01	m	18	45	43.95	-1.44E+01	5.77E-07	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	1.84E-05
ay	5.00E-02	m	19	47.5	43.95	-1.52E+01	2.60E-07	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	8.04E-06
			20	50	43.95	-1.60E+01	1.17E-07	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.51E-06



Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value															
v	4.18E-01	m/d		X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
Rc	4.15E+01															
u	1.01E-02	m/d	1	2.5	43.95	-7.98E-01	4.50E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	7.55E+01
			2	5	43.95	-1.60E+00	2.03E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	3.00E+01
			3	7.5	43.95	-2.39E+00	9.12E-02	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.21E+01
			4	10	43.95	-3.19E+00	4.11E-02	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	4.93E+00
			5	12.5	43.95	-3.99E+00	1.85E-02	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	2.04E+00
			6	15	43.95	-4.79E+00	8.32E-03	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	8.57E-01
			7	17.5	43.95	-5.59E+00	3.75E-03	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	3.62E-01
			8	20	43.95	-6.38E+00	1.69E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.54E-01
			9	22.5	43.95	-7.18E+00	7.60E-04	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	6.60E-02
			10	25	43.95	-7.98E+00	3.42E-04	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	2.84E-02
			11	27.5	43.95	-8.78E+00	1.54E-04	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	1.22E-02
			12	30	43.95	-9.58E+00	6.93E-05	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	5.28E-03
			13	32.5	43.95	-1.04E+01	3.12E-05	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	2.29E-03
			14	35	43.95	-1.12E+01	1.40E-05	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	9.94E-04
			15	37.5	43.95	-1.20E+01	6.32E-06	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	4.32E-04
			16	40	43.95	-1.28E+01	2.85E-06	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.88E-04
			17	42.5	43.95	-1.36E+01	1.28E-06	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	8.21E-05
			18	45	43.95	-1.44E+01	5.77E-07	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	3.58E-05
			19	47.5	43.95	-1.52E+01	2.60E-07	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	1.57E-05
			20	50	43.95	-1.60E+01	1.17E-07	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	6.86E-06



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

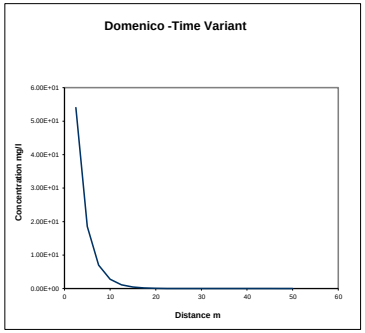
Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	8.35E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

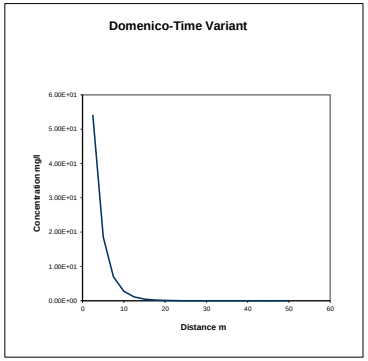
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-7.98E-01	4.50E-01	-9.41E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	5.40E+01
2	5	21.975	-1.60E+00	2.03E-01	-9.41E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	1.85E+01
3	7.5	21.975	-2.39E+00	9.12E-02	-9.41E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	7.00E+00
4	10	21.975	-3.19E+00	4.11E-02	-9.41E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	2.77E+00
5	12.5	21.975	-3.99E+00	1.85E-02	-9.41E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.12E+00
6	15	21.975	-4.79E+00	8.32E-03	-9.41E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	4.64E-01
7	17.5	21.975	-5.59E+00	3.75E-03	-9.41E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.94E-01
8	20	21.975	-6.38E+00	1.69E-03	-9.41E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	8.19E-02
9	22.5	21.975	-7.18E+00	7.60E-04	-9.41E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	3.48E-02
10	25	21.975	-7.98E+00	3.42E-04	-9.41E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	1.49E-02
11	27.5	21.975	-8.78E+00	1.54E-04	-9.41E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	6.39E-03
12	30	21.975	-9.58E+00	6.93E-05	-9.41E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.75E-03
13	32.5	21.975	-1.04E+01	3.12E-05	-9.41E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.19E-03
14	35	21.975	-1.12E+01	1.40E-05	-9.41E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	5.14E-04
15	37.5	21.975	-1.20E+01	6.32E-06	-9.41E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	2.23E-04
16	40	21.975	-1.28E+01	2.85E-06	-9.41E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	9.70E-05
17	42.5	21.975	-1.36E+01	1.28E-06	-9.41E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	4.22E-05
18	45	21.975	-1.44E+01	5.77E-07	-9.41E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	1.84E-05
19	47.5	21.975	-1.52E+01	2.60E-07	-9.41E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	8.04E-06
20	50	21.975	-1.60E+01	1.17E-07	-9.41E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.51E-06



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-7.98E-01	4.50E-01	-9.41E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	7.55E+01
2	5	21.975	-1.60E+00	2.03E-01	-9.41E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	3.00E+01
3	7.5	21.975	-2.39E+00	9.12E-02	-9.41E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.21E+01
4	10	21.975	-3.19E+00	4.11E-02	-9.41E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	4.93E+00
5	12.5	21.975	-3.99E+00	1.85E-02	-9.41E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	2.04E+00
6	15	21.975	-4.79E+00	8.32E-03	-9.41E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	8.57E-01
7	17.5	21.975	-5.59E+00	3.75E-03	-9.41E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	3.62E-01
8	20	21.975	-6.38E+00	1.69E-03	-9.41E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.54E-01
9	22.5	21.975	-7.18E+00	7.60E-04	-9.41E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	6.60E-02
10	25	21.975	-7.98E+00	3.42E-04	-9.41E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	2.84E-02
11	27.5	21.975	-8.78E+00	1.54E-04	-9.41E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	1.22E-02
12	30	21.975	-9.58E+00	6.93E-05	-9.41E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	5.28E-03
13	32.5	21.975	-1.04E+01	3.12E-05	-9.41E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	2.29E-03
14	35	21.975	-1.12E+01	1.40E-05	-9.41E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	9.94E-04
15	37.5	21.975	-1.20E+01	6.32E-06	-9.41E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	4.32E-04
16	40	21.975	-1.28E+01	2.85E-06	-9.41E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.88E-04
17	42.5	21.975	-1.36E+01	1.28E-06	-9.41E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	8.21E-05
18	45	21.975	-1.44E+01	5.77E-07	-9.41E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	3.58E-05
19	47.5	21.975	-1.52E+01	2.60E-07	-9.41E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	1.57E-05
20	50	21.975	-1.60E+01	1.17E-07	-9.41E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	6.86E-06



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment

Site Name:	**Tetrosyl**			
Site Address:	**Becis Green Bury**			
Completed by:	**BJT**			
Date:	**13.07.2021**		**Version:**	**1**
Contaminant	**Tolune**			
Target Concentration (C_T)	**0.074**	**mg/l**	**Origin of C_T:**	**R2174C-R09 - Tier 1 Criteria**

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	2.00E+00	days	R2174c-R10-App A
Calculated decay rate	λ	3.47E-01	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	3.47E-01	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.76E-06	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.66E+05**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**6.06E+04**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.23E+05	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point	**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**3.76E-06**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd	l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	0.00E+00	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

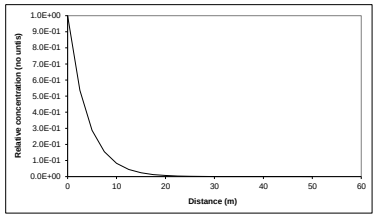
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	5.36E-01	4.62E+00
5.0	2.88E-01	2.48E+00
7.5	1.54E-01	1.33E+00
10.0	8.28E-02	7.13E-01
12.5	4.44E-02	3.82E-01
15.0	2.38E-02	2.05E-01
17.5	1.28E-02	1.10E-01
20.0	6.85E-03	5.90E-02
22.5	3.67E-03	3.16E-02
25.0	1.97E-03	1.69E-02
27.5	1.05E-03	9.07E-03
30.0	5.64E-04	4.86E-03
32.5	3.02E-04	2.60E-03
35.0	1.62E-04	1.39E-03
37.5	8.64E-05	7.43E-04
40.0	4.62E-05	3.97E-04
42.5	2.47E-05	2.12E-04
45.0	1.32E-05	1.13E-04
47.5	7.04E-06	6.06E-05
50.0	3.76E-06	3.24E-05

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

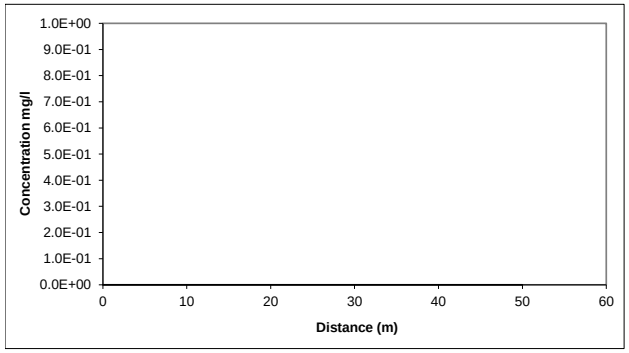
Water filled soil porosity	θ_W	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	2.66E+05

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	4.00E+00	days	R2174c-R10-App A
Calculated decay rate	λ	1.73E-01	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	4.17E-03	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	2.10E-03	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**8.38E+04**	

Remedial Targets

Remedial Target		**6.20E+03**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**2.10E-03**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

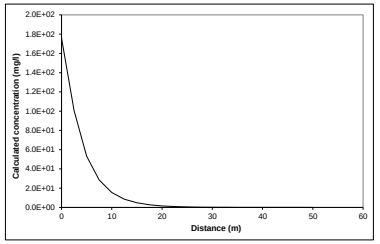
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.01E+02
5.0	5.32E+01
7.5	2.85E+01
10.0	1.55E+01
12.5	8.55E+00
15.0	4.77E+00
17.5	2.69E+00
20.0	1.52E+00
22.5	8.67E-01
25.0	4.96E-01
27.5	2.85E-01
30.0	1.64E-01
32.5	9.45E-02
35.0	5.46E-02
37.5	3.16E-02
40.0	1.83E-02
42.5	1.06E-02
45.0	6.19E-03
47.5	3.60E-03
50.0	2.10E-03

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	m^3/year

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Tolune**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 1.90E+00 l/kg

Calculated Remedial Target 1.51E-01 mg/kg for Tolune

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

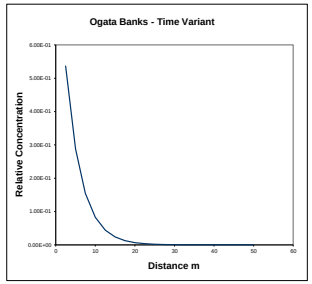
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune		
Input	**Value**	**Units**	
C_T	7.400E-02	mg/l	
DF	3.077E+00		
λ	3.466E-01	$days^{-1}$	
Sz	3.000E+01	m	
Sy	1.400E+01	m	
Kd	0.000E+00	l/kg	
ρ	2.350E+00	g/cm3	
n	1.100E-01		
i	5.925E-02		
K	1.150E+00	m/d	
x	5.000E+01	m	
z	0.000E+00	m	
y	0.000E+00	m	
t	1.000E+99	days	
ax	5.000E+00	m	
az	5.000E-01	m	
ay	5.000E-02	m	

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

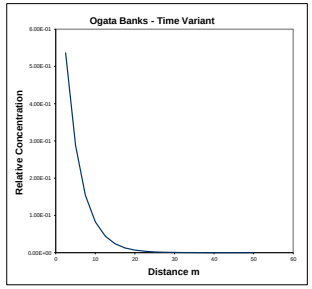
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.23E-01	5.36E-01	-1.94E+49	2	1.12E+00	3.07E+00	1.94E+49	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.36E-01
2	5	0.13	-1.25E+00	2.88E-01	-1.94E+49	2	2.25E+00	9.45E+00	1.94E+49	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.88E-01
3	7.5	0.13	-1.87E+00	1.54E-01	-1.94E+49	2	3.37E+00	2.90E+01	1.94E+49	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.54E-01
4	10	0.13	-2.49E+00	8.28E-02	-1.94E+49	2	4.49E+00	8.92E+01	1.94E+49	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.28E-02
5	12.5	0.13	-3.11E+00	4.44E-02	-1.94E+49	2	5.61E+00	2.74E+02	1.94E+49	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.44E-02
6	15	0.13	-3.74E+00	2.38E-02	-1.94E+49	2	6.74E+00	8.43E+02	1.94E+49	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	2.38E-02
7	17.5	0.13	-4.36E+00	1.28E-02	-1.94E+49	2	7.86E+00	2.59E+03	1.94E+49	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	1.28E-02
8	20	0.13	-4.98E+00	6.86E-03	-1.94E+49	2	8.98E+00	7.96E+03	1.94E+49	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.85E-03
9	22.5	0.13	-5.61E+00	3.68E-03	-1.94E+49	2	1.01E+01	2.45E+04	1.94E+49	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	3.67E-03
10	25	0.13	-6.23E+00	1.97E-03	-1.94E+49	2	1.12E+01	7.52E+04	1.94E+49	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	1.97E-03
11	27.5	0.13	-6.85E+00	1.06E-03	-1.94E+49	2	1.24E+01	2.31E+05	1.94E+49	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.05E-03
12	30	0.13	-7.47E+00	5.68E-04	-1.94E+49	2	1.35E+01	7.11E+05	1.94E+49	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	5.64E-04
13	32.5	0.13	-8.10E+00	3.05E-04	-1.94E+49	2	1.46E+01	2.18E+06	1.94E+49	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	3.02E-04
14	35	0.13	-8.72E+00	1.63E-04	-1.94E+49	2	1.57E+01	6.71E+06	1.94E+49	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	1.61E-04
15	37.5	0.13	-9.34E+00	8.76E-05	-1.94E+49	2	1.68E+01	2.06E+07	1.94E+49	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	8.64E-05
16	40	0.13	-9.97E+00	4.70E-05	-1.94E+49	2	1.80E+01	6.34E+07	1.94E+49	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	4.62E-05
17	42.5	0.13	-1.06E+01	2.52E-05	-1.94E+49	2	1.91E+01	1.95E+08	1.94E+49	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	2.47E-05
18	45	0.13	-1.12E+01	1.35E-05	-1.94E+49	2	2.02E+01	5.99E+08	1.94E+49	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	1.32E-05
19	47.5	0.13	-1.18E+01	7.26E-06	-1.94E+49	2	2.13E+01	1.84E+09	1.94E+49	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	7.03E-06
20	50	0.13	-1.25E+01	3.89E-06	-1.94E+49	2	2.25E+01	5.66E+09	1.94E+49	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	3.75E-06



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-6.23E-01	5.36E-01	-1.94E+49	2	1.12E+00	3.07E+00	1.94E+49	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
2	5	0.13	-1.25E+00	2.88E-01	-1.94E+49	2	2.25E+00	9.45E+00	1.94E+49	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
3	7.5	0.13	-1.87E+00	1.54E-01	-1.94E+49	2	3.37E+00	2.90E+01	1.94E+49	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
4	10	0.13	-2.49E+00	8.28E-02	-1.94E+49	2	4.49E+00	8.92E+01	1.94E+49	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
5	12.5	0.13	-3.11E+00	4.44E-02	-1.94E+49	2	5.61E+00	2.74E+02	1.94E+49	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.44E-02
6	15	0.13	-3.74E+00	2.38E-02	-1.94E+49	2	6.74E+00	8.43E+02	1.94E+49	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	2.38E-02
7	17.5	0.13	-4.36E+00	1.28E-02	-1.94E+49	2	7.86E+00	2.59E+03	1.94E+49	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	1.28E-02
8	20	0.13	-4.98E+00	6.86E-03	-1.94E+49	2	8.98E+00	7.96E+03	1.94E+49	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.85E-03
9	22.5	0.13	-5.61E+00	3.68E-03	-1.94E+49	2	1.01E+01	2.45E+04	1.94E+49	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	3.67E-03
10	25	0.13	-6.23E+00	1.97E-03	-1.94E+49	2	1.12E+01	7.52E+04	1.94E+49	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.97E-03
11	27.5	0.13	-6.85E+00	1.06E-03	-1.94E+49	2	1.24E+01	2.31E+05	1.94E+49	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.05E-03
12	30	0.13	-7.47E+00	5.68E-04	-1.94E+49	2	1.35E+01	7.11E+05	1.94E+49	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	5.64E-04
13	32.5	0.13	-8.10E+00	3.05E-04	-1.94E+49	2	1.46E+01	2.18E+06	1.94E+49	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	3.02E-04
14	35	0.13	-8.72E+00	1.63E-04	-1.94E+49	2	1.57E+01	6.71E+06	1.94E+49	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	1.62E-04
15	37.5	0.13	-9.34E+00	8.76E-05	-1.94E+49	2	1.68E+01	2.06E+07	1.94E+49	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	8.64E-05
16	40	0.13	-9.97E+00	4.70E-05	-1.94E+49	2	1.80E+01	6.34E+07	1.94E+49	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	4.62E-05
17	42.5	0.13	-1.06E+01	2.52E-05	-1.94E+49	2	1.91E+01	1.95E+08	1.94E+49	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	2.47E-05
18	45	0.13	-1.12E+01	1.35E-05	-1.94E+49	2	2.02E+01	5.99E+08	1.94E+49	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	1.32E-05
19	47.5	0.13	-1.18E+01	7.26E-06	-1.94E+49	2	2.13E+01	1.84E+09	1.94E+49	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	7.04E-06
20	50	0.13	-1.25E+01	3.89E-06	-1.94E+49	2	2.25E+01	5.66E+09	1.94E+49	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	3.76E-06



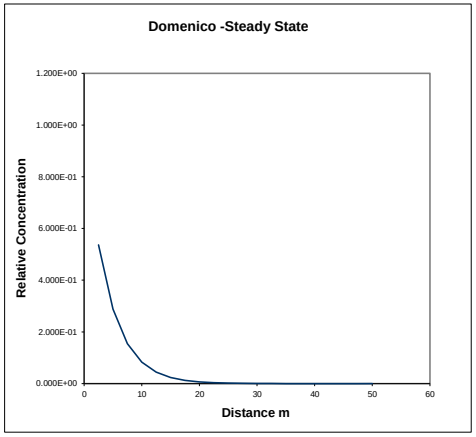
Date:	13.07.2021
Version:	1

Contaminant	Toluene	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	3.466E-01	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.23E-01	5.36E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.364E-01
2	5	0.25	-1.25E+00	2.88E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.878E-01
3	7.5	0.25	-1.87E+00	1.54E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.544E-01
4	10	0.25	-2.49E+00	8.28E-02	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.280E-02
5	12.5	0.25	-3.11E+00	4.44E-02	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.442E-02
6	15	0.25	-3.74E+00	2.38E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	2.382E-02
7	17.5	0.25	-4.36E+00	1.28E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	1.278E-02
8	20	0.25	-4.98E+00	6.86E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	6.851E-03
9	22.5	0.25	-5.61E+00	3.68E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	3.672E-03
10	25	0.25	-6.23E+00	1.97E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	1.968E-03
11	27.5	0.25	-6.85E+00	1.06E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.054E-03
12	30	0.25	-7.47E+00	5.68E-04	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	5.642E-04
13	32.5	0.25	-8.10E+00	3.05E-04	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	3.019E-04
14	35	0.25	-8.72E+00	1.63E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	1.615E-04
15	37.5	0.25	-9.34E+00	8.76E-05	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	8.635E-05
16	40	0.25	-9.97E+00	4.70E-05	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	4.615E-05
17	42.5	0.25	-1.06E+01	2.52E-05	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	2.466E-05
18	45	0.25	-1.12E+01	1.35E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	1.317E-05
19	47.5	0.25	-1.18E+01	7.26E-06	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	7.033E-06
20	50	0.25	-1.25E+01	3.89E-06	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	3.754E-06

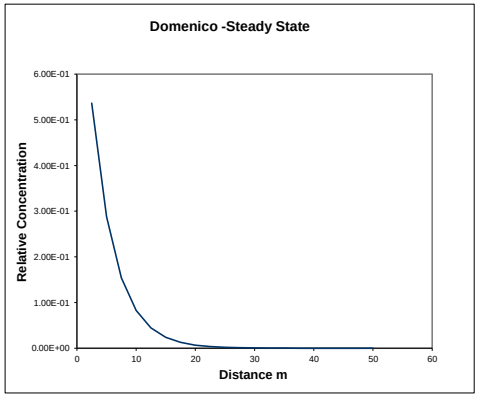


Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

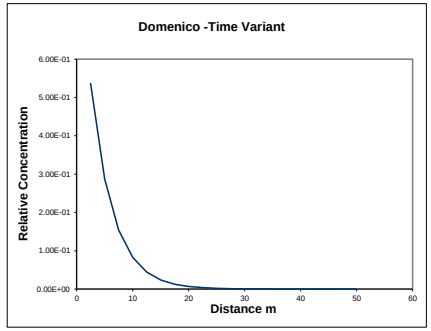
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-6.23E-01	5.36E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
2	5	0.25	-1.25E+00	2.88E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
3	7.5	0.25	-1.87E+00	1.54E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
4	10	0.25	-2.49E+00	8.28E-02	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
5	12.5	0.25	-3.11E+00	4.44E-02	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.44E-02
6	15	0.25	-3.74E+00	2.38E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	2.38E-02
7	17.5	0.25	-4.36E+00	1.28E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	1.28E-02
8	20	0.25	-4.98E+00	6.86E-03	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	6.85E-03
9	22.5	0.25	-5.61E+00	3.68E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	3.67E-03
10	25	0.25	-6.23E+00	1.97E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.97E-03
11	27.5	0.25	-6.85E+00	1.06E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.05E-03
12	30	0.25	-7.47E+00	5.68E-04	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	5.64E-04
13	32.5	0.25	-8.10E+00	3.05E-04	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	3.02E-04
14	35	0.25	-8.72E+00	1.63E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	1.62E-04
15	37.5	0.25	-9.34E+00	8.76E-05	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	8.64E-05
16	40	0.25	-9.97E+00	4.70E-05	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	4.62E-05
17	42.5	0.25	-1.06E+01	2.52E-05	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	2.47E-05
18	45	0.25	-1.12E+01	1.35E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	1.32E-05
19	47.5	0.25	-1.18E+01	7.26E-06	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	7.04E-06
20	50	0.25	-1.25E+01	3.89E-06	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	3.76E-06



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

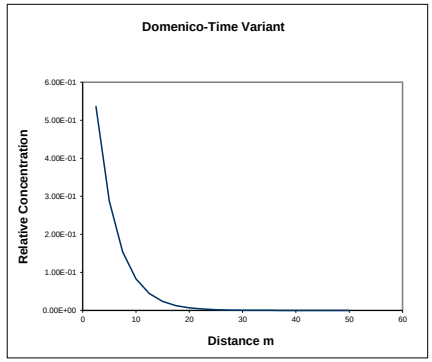
Contaminant	Tolune															
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)													
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	0.125	-6.23E-01	5.36E-01	-1.94E+49	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	5.36E-01
DF	3.0774		2	5	0.125	-1.25E+00	2.88E-01	-1.94E+49	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	2.88E-01
			3	7.5	0.125	-1.87E+00	1.54E-01	-1.94E+49	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.54E-01
			4	10	0.125	-2.49E+00	8.28E-02	-1.94E+49	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	8.28E-02
λ	3.466E-01	$days^{-1}$	5	12.5	0.125	-3.11E+00	4.44E-02	-1.94E+49	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.44E-02
Sz	3.000E+01	m	6	15	0.125	-3.74E+00	2.38E-02	-1.94E+49	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	2.38E-02
Sy	1.400E+01	m	7	17.5	0.125	-4.36E+00	1.28E-02	-1.94E+49	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	1.28E-02
Kd	0.000E+00	l/kg	8	20	0.125	-4.98E+00	6.86E-03	-1.94E+49	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	6.85E-03
ρ	2.350E+00	g/cm3	9	22.5	0.125	-5.61E+00	3.68E-03	-1.94E+49	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	3.67E-03
n	1.100E-01		10	25	0.125	-6.23E+00	1.97E-03	-1.94E+49	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	1.97E-03
i	5.925E-02		11	27.5	0.125	-6.85E+00	1.06E-03	-1.94E+49	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.05E-03
K	1.150E+00	m/d	12	30	0.125	-7.47E+00	5.68E-04	-1.94E+49	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	5.64E-04
x	5.000E+01	m	13	32.5	0.125	-8.10E+00	3.05E-04	-1.94E+49	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	3.02E-04
z	0.000E+00	m	14	35	0.125	-8.72E+00	1.63E-04	-1.94E+49	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	1.61E-04
y	0.000E+00	m	15	37.5	0.125	-9.34E+00	8.76E-05	-1.94E+49	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	8.64E-05
t	1.000E+99	days	16	40	0.125	-9.97E+00	4.70E-05	-1.94E+49	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	4.62E-05
ax	5.000E+00	m	17	42.5	0.125	-1.06E+01	2.52E-05	-1.94E+49	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	2.47E-05
az	5.000E-01	m	18	45	0.125	-1.12E+01	1.35E-05	-1.94E+49	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	1.32E-05
ay	5.000E-02	m	19	47.5	0.125	-1.18E+01	7.26E-06	-1.94E+49	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	7.03E-06
			20	50	0.125	-1.25E+01	3.89E-06	-1.94E+49	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	3.75E-06



Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

Date:	13.07.2021
Version:	1

	Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT															
		X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
		m														
	1	2.5	0.125	-6.23E-01	5.36E-01	-1.94E+49	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	5.36E-01
	2	5	0.125	-1.25E+00	2.88E-01	-1.94E+49	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	2.88E-01
	3	7.5	0.125	-1.87E+00	1.54E-01	-1.94E+49	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.54E-01
	4	10	0.125	-2.49E+00	8.28E-02	-1.94E+49	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	8.28E-02
	5	12.5	0.125	-3.11E+00	4.44E-02	-1.94E+49	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.44E-02
	6	15	0.125	-3.74E+00	2.38E-02	-1.94E+49	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	2.38E-02
	7	17.5	0.125	-4.36E+00	1.28E-02	-1.94E+49	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	1.28E-02
	8	20	0.125	-4.98E+00	6.86E-03	-1.94E+49	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	6.85E-03
	9	22.5	0.125	-5.61E+00	3.68E-03	-1.94E+49	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	3.67E-03
	10	25	0.125	-6.23E+00	1.97E-03	-1.94E+49	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	1.97E-03
	11	27.5	0.125	-6.85E+00	1.06E-03	-1.94E+49	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.05E-03
	12	30	0.125	-7.47E+00	5.68E-04	-1.94E+49	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	5.64E-04
	13	32.5	0.125	-8.10E+00	3.05E-04	-1.94E+49	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	3.02E-04
	14	35	0.125	-8.72E+00	1.63E-04	-1.94E+49	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	1.62E-04
	15	37.5	0.125	-9.34E+00	8.76E-05	-1.94E+49	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	8.64E-05
	16	40	0.125	-9.97E+00	4.70E-05	-1.94E+49	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	4.62E-05
	17	42.5	0.125	-1.06E+01	2.52E-05	-1.94E+49	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	2.47E-05
	18	45	0.125	-1.12E+01	1.35E-05	-1.94E+49	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	1.32E-05
	19	47.5	0.125	-1.18E+01	7.26E-06	-1.94E+49	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	7.04E-06
	20	50	0.125	-1.25E+01	3.89E-06	-1.94E+49	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	3.76E-06



OGATA BANKS SOLUTION

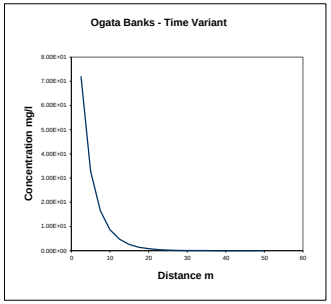
Contaminant	Toluene	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	4.17E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

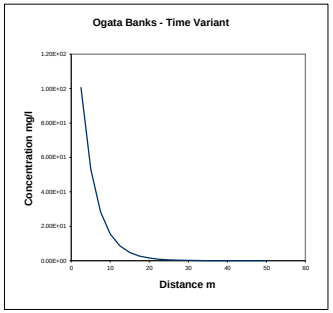
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-5.1E-01	6.0E-01	-6.8E+48	2.000	1.0E+00	2.8E+00	6.8E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	7.19E+01
2	5	21.975	-1.0E+00	3.6E-01	-6.8E+48	2.000	2.0E+00	7.6E+00	6.8E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	3.29E+01
3	7.5	21.975	-1.5E+00	2.2E-01	-6.8E+48	2.000	3.0E+00	2.1E+01	6.8E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	1.65E+01
4	10	21.975	-2.0E+00	1.3E-01	-6.8E+48	2.000	4.0E+00	5.7E+01	6.8E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	8.69E+00
5	12.5	21.975	-2.6E+00	7.7E-02	-6.8E+48	2.000	5.1E+00	1.6E+02	6.8E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	4.69E+00
6	15	21.975	-3.1E+00	4.6E-02	-6.8E+48	2.000	6.1E+00	4.3E+02	6.8E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	2.58E+00
7	17.5	21.975	-3.6E+00	2.8E-02	-6.8E+48	2.000	7.1E+00	1.2E+03	6.8E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.44E+00
8	20	21.975	-4.1E+00	1.7E-02	-6.8E+48	2.000	8.1E+00	3.3E+03	6.8E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	8.08E-01
9	22.5	21.975	-4.6E+00	1.0E-02	-6.8E+48	2.000	9.1E+00	9.0E+03	6.8E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.57E-01
10	25	21.975	-5.1E+00	6.0E-03	-6.8E+48	2.000	1.0E+01	2.5E+04	6.8E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	2.60E-01
11	27.5	21.975	-5.6E+00	3.6E-03	-6.8E+48	2.000	1.1E+01	6.8E+04	6.8E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	1.49E-01
12	30	21.975	-6.1E+00	2.1E-03	-6.8E+48	2.000	1.2E+01	1.9E+05	6.8E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	8.53E-02
13	32.5	21.975	-6.7E+00	1.3E-03	-6.8E+48	2.000	1.3E+01	5.2E+05	6.8E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	4.90E-02
14	35	21.975	-7.2E+00	7.7E-04	-6.8E+48	2.000	1.4E+01	1.4E+06	6.8E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	2.83E-02
15	37.5	21.975	-7.7E+00	4.6E-04	-6.8E+48	2.000	1.5E+01	3.9E+06	6.8E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.63E-02
16	40	21.975	-8.2E+00	2.8E-04	-6.8E+48	2.000	1.6E+01	1.1E+07	6.8E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	9.45E-03
17	42.5	21.975	-8.7E+00	1.7E-04	-6.8E+48	2.000	1.7E+01	3.0E+07	6.8E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	5.48E-03
18	45	21.975	-9.2E+00	1.0E-04	-6.8E+48	2.000	1.8E+01	8.1E+07	6.8E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	3.18E-03
19	47.5	21.975	-9.7E+00	6.0E-05	-6.8E+48	2.000	1.9E+01	2.2E+08	6.8E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	1.85E-03
20	50	21.975	-1.0E+01	3.6E-05	-6.8E+48	2.000	2.0E+01	6.2E+08	6.8E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	1.08E-03



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-5.1E-01	6.0E-01	-6.8E+48	2.000	1.0E+00	2.8E+00	6.8E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.01E+02
2	5	21.975	-1.0E+00	3.6E-01	-6.8E+48	2.000	2.0E+00	7.6E+00	6.8E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	5.32E+01
3	7.5	21.975	-1.5E+00	2.2E-01	-6.8E+48	2.000	3.0E+00	2.1E+01	6.8E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	2.85E+01
4	10	21.975	-2.0E+00	1.3E-01	-6.8E+48	2.000	4.0E+00	5.7E+01	6.8E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.55E+01
5	12.5	21.975	-2.6E+00	7.7E-02	-6.8E+48	2.000	5.1E+00	1.6E+02	6.8E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	8.55E+00
6	15	21.975	-3.1E+00	4.6E-02	-6.8E+48	2.000	6.1E+00	4.3E+02	6.8E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	4.77E+00
7	17.5	21.975	-3.6E+00	2.8E-02	-6.8E+48	2.000	7.1E+00	1.2E+03	6.8E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	2.69E+00
8	20	21.975	-4.1E+00	1.7E-02	-6.8E+48	2.000	8.1E+00	3.3E+03	6.8E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.52E+00
9	22.5	21.975	-4.6E+00	1.0E-02	-6.8E+48	2.000	9.1E+00	9.0E+03	6.8E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	8.67E-01
10	25	21.975	-5.1E+00	6.0E-03	-6.8E+48	2.000	1.0E+01	2.5E+04	6.8E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	4.96E-01
11	27.5	21.975	-5.6E+00	3.6E-03	-6.8E+48	2.000	1.1E+01	6.8E+04	6.8E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	2.85E-01
12	30	21.975	-6.1E+00	2.1E-03	-6.8E+48	2.000	1.2E+01	1.9E+05	6.8E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	1.64E-01
13	32.5	21.975	-6.7E+00	1.3E-03	-6.8E+48	2.000	1.3E+01	5.2E+05	6.8E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	9.45E-02
14	35	21.975	-7.2E+00	7.7E-04	-6.8E+48	2.000	1.4E+01	1.4E+06	6.8E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	5.46E-02
15	37.5	21.975	-7.7E+00	4.6E-04	-6.8E+48	2.000	1.5E+01	3.9E+06	6.8E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	3.16E-02
16	40	21.975	-8.2E+00	2.8E-04	-6.8E+48	2.000	1.6E+01	1.1E+07	6.8E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.83E-02
17	42.5	21.975	-8.7E+00	1.7E-04	-6.8E+48	2.000	1.7E+01	3.0E+07	6.8E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.06E-02
18	45	21.975	-9.2E+00	1.0E-04	-6.8E+48	2.000	1.8E+01	8.1E+07	6.8E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	6.19E-03
19	47.5	21.975	-9.7E+00	6.0E-05	-6.8E+48	2.000	1.9E+01	2.2E+08	6.8E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	3.60E-03
20	50	21.975	-1.0E+01	3.6E-05	-6.8E+48	2.000	2.0E+01	6.2E+08	6.8E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	2.10E-03

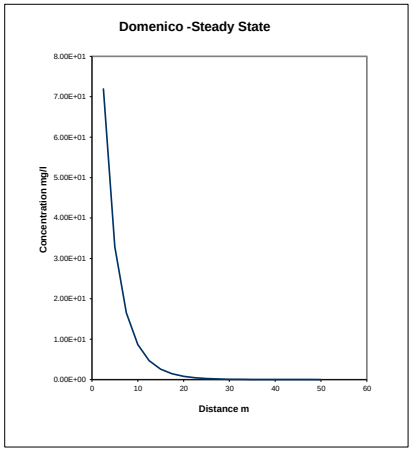


Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Tolune														
Input	**Value**	**Units**		X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
C_T	0.074	mg/l	1	2.5	43.95	-5.12E-01	5.99E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	7.19E+01
			2	5	43.95	-1.02E+00	3.59E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	3.29E+01
			3	7.5	43.95	-1.54E+00	2.15E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	1.65E+01
Co	1.76E+02	mg/l	4	10	43.95	-2.05E+00	1.29E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	8.69E+00
λ	4.17E-03	$days^{-1}$	5	12.5	43.95	-2.56E+00	7.73E-02	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	4.69E+00
Sz	3.00E+01	m	6	15	43.95	-3.07E+00	4.64E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	2.58E+00
Sy	1.00E+00	m	7	17.5	43.95	-3.58E+00	2.78E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.44E+00
Kd	1.90E+00	l/kg	8	20	43.95	-4.10E+00	1.67E-02	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	8.08E-01
ρ	2.35E+00	g/cm3	9	22.5	43.95	-4.61E+00	9.98E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.57E-01
n	1.10E-01		10	25	43.95	-5.12E+00	5.98E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	2.60E-01
i	4.00E-02		11	27.5	43.95	-5.63E+00	3.59E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	1.49E-01
K	1.15E+00	m/d	12	30	43.95	-6.14E+00	2.15E-03	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	8.53E-02
x	5.00E+01	m	13	32.5	43.95	-6.65E+00	1.29E-03	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	4.90E-02
z	0.00E+00	m	14	35	43.95	-7.17E+00	7.72E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	2.83E-02
y	0.00E+00	m	15	37.5	43.95	-7.68E+00	4.63E-04	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.63E-02
			16	40	43.95	-8.19E+00	2.77E-04	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	9.45E-03
ax	5.00E+00	m	17	42.5	43.95	-8.70E+00	1.66E-04	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	5.48E-03
az	5.00E-01	m	18	45	43.95	-9.21E+00	9.96E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	3.18E-03
ay	5.00E-02	m	19	47.5	43.95	-9.73E+00	5.97E-05	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	1.85E-03
			20	50	43.95	-1.02E+01	3.58E-05	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	1.08E-03

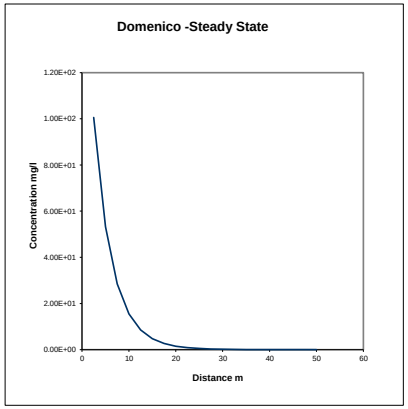


Vertical dispersion optio Simulate vertical dispersion in 1 direction

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc	**Value**			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
v	4.18E-01	m/d	1	2.5	43.95	-5.12E-01	5.99E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.01E+02
Rc	4.15E+01		2	5	43.95	-1.02E+00	3.59E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	5.32E+01
u	1.01E-02	m/d	3	7.5	43.95	-1.54E+00	2.15E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	2.85E+01
			4	10	43.95	-2.05E+00	1.29E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.55E+01
			5	12.5	43.95	-2.56E+00	7.73E-02	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	8.55E+00
			6	15	43.95	-3.07E+00	4.64E-02	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	4.77E+00
			7	17.5	43.95	-3.58E+00	2.78E-02	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	2.69E+00
			8	20	43.95	-4.10E+00	1.67E-02	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.52E+00
			9	22.5	43.95	-4.61E+00	9.98E-03	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	8.67E-01
			10	25	43.95	-5.12E+00	5.98E-03	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	4.96E-01
			11	27.5	43.95	-5.63E+00	3.59E-03	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	2.85E-01
			12	30	43.95	-6.14E+00	2.15E-03	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	1.64E-01
			13	32.5	43.95	-6.65E+00	1.29E-03	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	9.45E-02
			14	35	43.95	-7.17E+00	7.72E-04	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	5.46E-02
			15	37.5	43.95	-7.68E+00	4.63E-04	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	3.16E-02
			16	40	43.95	-8.19E+00	2.77E-04	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.83E-02
			17	42.5	43.95	-8.70E+00	1.66E-04	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.06E-02
			18	45	43.95	-9.21E+00	9.96E-05	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	6.19E-03
			19	47.5	43.95	-9.73E+00	5.97E-05	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	3.60E-03
			20	50	43.95	-1.02E+01	3.58E-05	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	2.10E-03



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

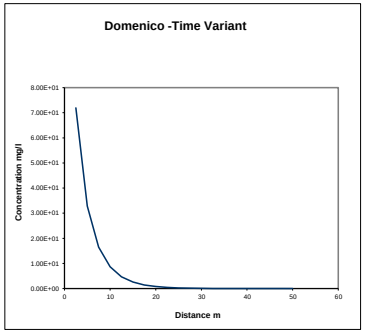
Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	4.17E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

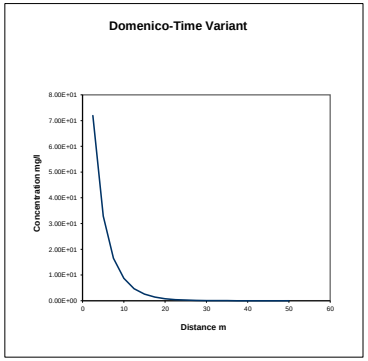
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-5.12E-01	5.99E-01	-6.84E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	7.19E+01
2	5	21.975	-1.02E+00	3.59E-01	-6.84E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	3.29E+01
3	7.5	21.975	-1.54E+00	2.15E-01	-6.84E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	1.65E+01
4	10	21.975	-2.05E+00	1.29E-01	-6.84E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	8.69E+00
5	12.5	21.975	-2.56E+00	7.73E-02	-6.84E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	4.69E+00
6	15	21.975	-3.07E+00	4.64E-02	-6.84E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	2.58E+00
7	17.5	21.975	-3.58E+00	2.78E-02	-6.84E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.44E+00
8	20	21.975	-4.10E+00	1.67E-02	-6.84E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	8.08E-01
9	22.5	21.975	-4.61E+00	9.98E-03	-6.84E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.57E-01
10	25	21.975	-5.12E+00	5.98E-03	-6.84E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	2.60E-01
11	27.5	21.975	-5.63E+00	3.59E-03	-6.84E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	1.49E-01
12	30	21.975	-6.14E+00	2.15E-03	-6.84E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	8.53E-02
13	32.5	21.975	-6.65E+00	1.29E-03	-6.84E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	4.90E-02
14	35	21.975	-7.17E+00	7.72E-04	-6.84E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	2.83E-02
15	37.5	21.975	-7.68E+00	4.63E-04	-6.84E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.63E-02
16	40	21.975	-8.19E+00	2.77E-04	-6.84E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	9.45E-03
17	42.5	21.975	-8.70E+00	1.66E-04	-6.84E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	5.48E-03
18	45	21.975	-9.21E+00	9.96E-05	-6.84E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	3.18E-03
19	47.5	21.975	-9.73E+00	5.97E-05	-6.84E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	1.85E-03
20	50	21.975	-1.02E+01	3.58E-05	-6.84E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	1.08E-03



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-5.12E-01	5.99E-01	-6.84E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.01E+02
2	5	21.975	-1.02E+00	3.59E-01	-6.84E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	5.32E+01
3	7.5	21.975	-1.54E+00	2.15E-01	-6.84E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	2.85E+01
4	10	21.975	-2.05E+00	1.29E-01	-6.84E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.55E+01
5	12.5	21.975	-2.56E+00	7.73E-02	-6.84E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	8.55E+00
6	15	21.975	-3.07E+00	4.64E-02	-6.84E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	4.77E+00
7	17.5	21.975	-3.58E+00	2.78E-02	-6.84E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	2.69E+00
8	20	21.975	-4.10E+00	1.67E-02	-6.84E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.52E+00
9	22.5	21.975	-4.61E+00	9.98E-03	-6.84E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	8.67E-01
10	25	21.975	-5.12E+00	5.98E-03	-6.84E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	4.96E-01
11	27.5	21.975	-5.63E+00	3.59E-03	-6.84E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	2.85E-01
12	30	21.975	-6.14E+00	2.15E-03	-6.84E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	1.64E-01
13	32.5	21.975	-6.65E+00	1.29E-03	-6.84E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	9.45E-02
14	35	21.975	-7.17E+00	7.72E-04	-6.84E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	5.46E-02
15	37.5	21.975	-7.68E+00	4.63E-04	-6.84E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	3.16E-02
16	40	21.975	-8.19E+00	2.77E-04	-6.84E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.83E-02
17	42.5	21.975	-8.70E+00	1.66E-04	-6.84E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.06E-02
18	45	21.975	-9.21E+00	9.96E-05	-6.84E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	6.19E-03
19	47.5	21.975	-9.73E+00	5.97E-05	-6.84E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	3.60E-03
20	50	21.975	-1.02E+01	3.58E-05	-6.84E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	2.10E-03



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Tolune			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Toluene		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	5.78E-02	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.03E-02	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**3.30E+01**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**7.52E+00**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.53E+01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration (C_{ED}/C_0)	**3.03E-02**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	0.00E+00	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

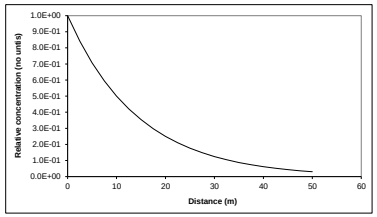
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	8.61E+00
2.5	8.41E-01	7.24E+00
5.0	7.07E-01	6.09E+00
7.5	5.95E-01	5.12E+00
10.0	5.00E-01	4.31E+00
12.5	4.21E-01	3.62E+00
15.0	3.54E-01	3.05E+00
17.5	2.97E-01	2.56E+00
20.0	2.50E-01	2.15E+00
22.5	2.10E-01	1.81E+00
25.0	1.77E-01	1.52E+00
27.5	1.48E-01	1.28E+00
30.0	1.24E-01	1.07E+00
32.5	1.04E-01	8.99E-01
35.0	8.76E-02	7.54E-01
37.5	7.34E-02	6.32E-01
40.0	6.15E-02	5.30E-01
42.5	5.16E-02	4.44E-01
45.0	4.32E-02	3.72E-01
47.5	3.62E-02	3.11E-01
50.0	3.03E-02	2.61E-01

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

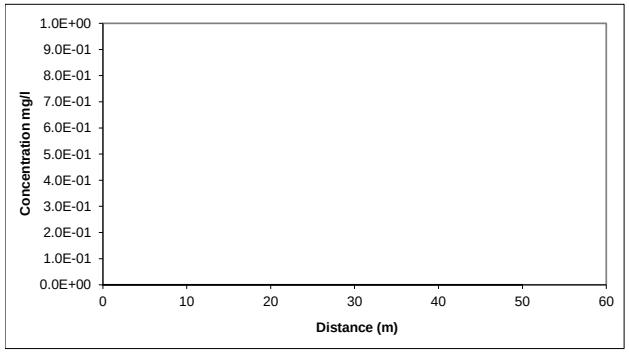
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	3.30E+01

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	1.20E+01	days	R2174c-R10-App A
Calculated decay rate	λ	5.78E-02	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.39E-03	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.34E-01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**3.29E+02**	

Remedial Targets

Remedial Target		**2.44E+01**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**5.34E-01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

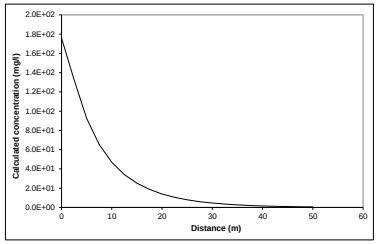
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.33E+02
5.0	9.26E+01
7.5	6.53E+01
10.0	4.69E+01
12.5	3.42E+01
15.0	2.51E+01
17.5	1.87E+01
20.0	1.40E+01
22.5	1.05E+01
25.0	7.91E+00
27.5	5.99E+00
30.0	4.55E+00
32.5	3.46E+00
35.0	2.64E+00
37.5	2.01E+00
40.0	1.54E+00
42.5	1.18E+00
45.0	9.05E-01
47.5	6.95E-01
50.0	5.34E-01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Tolune**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

	calc	calc	Calc Kd	l/kg
Calculation of partition coefficient for ionic organic chemical				
Partition coefficient used in Level 1 Assessment			1.90E+00	l/kg

Calculated Remedial Target	**1.51E-01**	**mg/kg**	**for**	**Tolune**

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

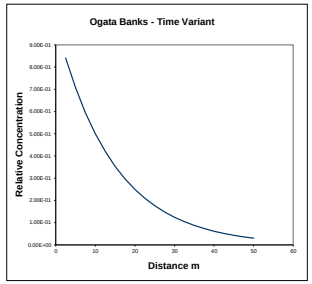
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	5.776E-02	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

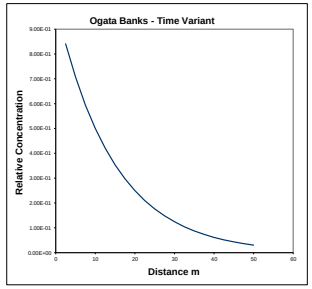
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-9.42E+48	2	6.73E-01	1.96E+00	9.42E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-9.42E+48	2	1.35E+00	3.84E+00	9.42E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-9.42E+48	2	2.02E+00	7.53E+00	9.42E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-9.42E+48	2	2.69E+00	1.48E+01	9.42E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-9.42E+48	2	3.37E+00	2.90E+01	9.42E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-9.42E+48	2	4.04E+00	5.68E+01	9.42E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-9.42E+48	2	4.71E+00	1.11E+02	9.42E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-9.42E+48	2	5.39E+00	2.18E+02	9.42E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-9.42E+48	2	6.06E+00	4.28E+02	9.42E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-9.42E+48	2	6.73E+00	8.38E+02	9.42E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-9.42E+48	2	7.40E+00	1.64E+03	9.42E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-9.42E+48	2	8.08E+00	3.22E+03	9.42E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-9.42E+48	2	8.75E+00	6.32E+03	9.42E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-9.42E+48	2	9.42E+00	1.24E+04	9.42E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-9.42E+48	2	1.01E+01	2.43E+04	9.42E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-9.42E+48	2	1.08E+01	4.76E+04	9.42E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-9.42E+48	2	1.14E+01	9.33E+04	9.42E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	5.15E-02
18	45	0.13	-3.12E+00	4.43E-02	-9.42E+48	2	1.21E+01	1.83E+05	9.42E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	4.31E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-9.42E+48	2	1.28E+01	3.59E+05	9.42E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	3.61E-02
20	50	0.13	-3.46E+00	3.13E-02	-9.42E+48	2	1.35E+01	7.03E+05	9.42E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	3.02E-02



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.73E-01	8.41E-01	-9.42E+48	2	6.73E-01	1.96E+00	9.42E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.13	-3.46E-01	7.07E-01	-9.42E+48	2	1.35E+00	3.84E+00	9.42E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.13	-5.19E-01	5.95E-01	-9.42E+48	2	2.02E+00	7.53E+00	9.42E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.13	-6.93E-01	5.00E-01	-9.42E+48	2	2.69E+00	1.48E+01	9.42E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.13	-8.66E-01	4.21E-01	-9.42E+48	2	3.37E+00	2.90E+01	9.42E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.13	-1.04E+00	3.54E-01	-9.42E+48	2	4.04E+00	5.68E+01	9.42E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.13	-1.21E+00	2.98E-01	-9.42E+48	2	4.71E+00	1.11E+02	9.42E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.13	-1.39E+00	2.50E-01	-9.42E+48	2	5.39E+00	2.18E+02	9.42E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.13	-1.56E+00	2.10E-01	-9.42E+48	2	6.06E+00	4.28E+02	9.42E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.13	-1.73E+00	1.77E-01	-9.42E+48	2	6.73E+00	8.38E+02	9.42E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.13	-1.90E+00	1.49E-01	-9.42E+48	2	7.40E+00	1.64E+03	9.42E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.13	-2.08E+00	1.25E-01	-9.42E+48	2	8.08E+00	3.22E+03	9.42E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.13	-2.25E+00	1.05E-01	-9.42E+48	2	8.75E+00	6.32E+03	9.42E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.13	-2.42E+00	8.86E-02	-9.42E+48	2	9.42E+00	1.24E+04	9.42E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.13	-2.60E+00	7.45E-02	-9.42E+48	2	1.01E+01	2.43E+04	9.42E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.13	-2.77E+00	6.26E-02	-9.42E+48	2	1.08E+01	4.76E+04	9.42E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.13	-2.94E+00	5.27E-02	-9.42E+48	2	1.14E+01	9.33E+04	9.42E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.13	-3.12E+00	4.43E-02	-9.42E+48	2	1.21E+01	1.83E+05	9.42E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.13	-3.29E+00	3.73E-02	-9.42E+48	2	1.28E+01	3.59E+05	9.42E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.13	-3.46E+00	3.13E-02	-9.42E+48	2	1.35E+01	7.03E+05	9.42E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	3.03E-02



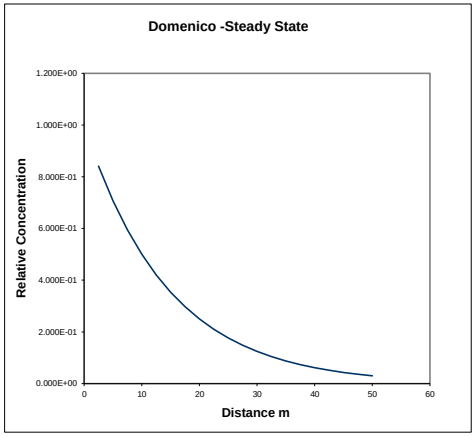
Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Contaminant	Toluene	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	5.776E-02	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.410E-01
2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.073E-01
3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.949E-01
4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.003E-01
5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.207E-01
6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	3.538E-01
7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	2.975E-01
8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	2.501E-01
9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	2.102E-01
10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	1.765E-01
11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	1.482E-01
12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	1.244E-01
13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	1.044E-01
14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	8.755E-02
15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	7.339E-02
16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	6.150E-02
17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	5.152E-02
18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	4.314E-02
19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	3.611E-02
20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	3.022E-02

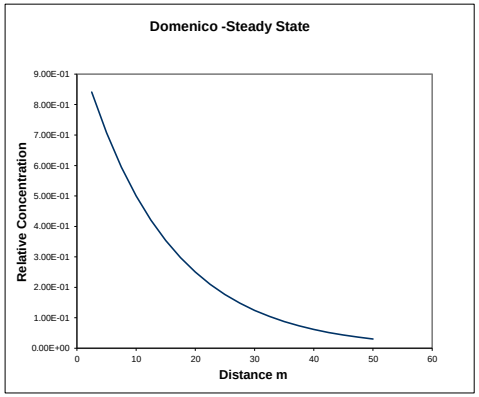


DOMENICO (STEADY STATE)

Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

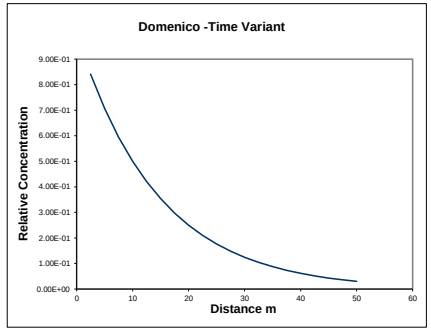
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.73E-01	8.41E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
2	5	0.25	-3.46E-01	7.07E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
3	7.5	0.25	-5.19E-01	5.95E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
4	10	0.25	-6.93E-01	5.00E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
5	12.5	0.25	-8.66E-01	4.21E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
6	15	0.25	-1.04E+00	3.54E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	3.54E-01
7	17.5	0.25	-1.21E+00	2.98E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	2.97E-01
8	20	0.25	-1.39E+00	2.50E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	2.50E-01
9	22.5	0.25	-1.56E+00	2.10E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	2.10E-01
10	25	0.25	-1.73E+00	1.77E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	1.77E-01
11	27.5	0.25	-1.90E+00	1.49E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	1.48E-01
12	30	0.25	-2.08E+00	1.25E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	1.24E-01
13	32.5	0.25	-2.25E+00	1.05E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	1.04E-01
14	35	0.25	-2.42E+00	8.86E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	8.76E-02
15	37.5	0.25	-2.60E+00	7.45E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	7.34E-02
16	40	0.25	-2.77E+00	6.26E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	6.15E-02
17	42.5	0.25	-2.94E+00	5.27E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	5.16E-02
18	45	0.25	-3.12E+00	4.43E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	4.32E-02
19	47.5	0.25	-3.29E+00	3.73E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	3.62E-02
20	50	0.25	-3.46E+00	3.13E-02	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	3.03E-02



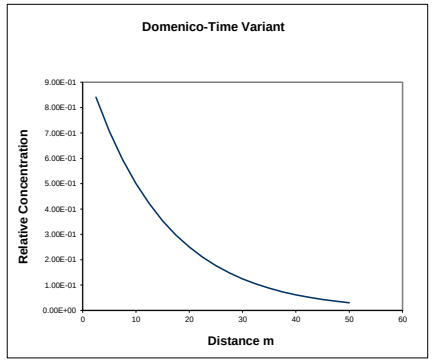
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Tolune																
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	0.125	-1.73E-01	8.41E-01	-9.42E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	8.41E-01
DF	3.0774		2	5	0.125	-3.46E-01	7.07E-01	-9.42E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	7.07E-01
			3	7.5	0.125	-5.19E-01	5.95E-01	-9.42E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	5.95E-01
			4	10	0.125	-6.93E-01	5.00E-01	-9.42E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	5.00E-01
λ	5.776E-02	$days^{-1}$	5	12.5	0.125	-8.66E-01	4.21E-01	-9.42E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	4.21E-01
Sz	3.000E+01	m	6	15	0.125	-1.04E+00	3.54E-01	-9.42E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	3.54E-01
Sy	1.400E+01	m	7	17.5	0.125	-1.21E+00	2.98E-01	-9.42E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	2.97E-01
Kd	0.000E+00	l/kg	8	20	0.125	-1.39E+00	2.50E-01	-9.42E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	2.50E-01
ρ	2.350E+00	g/cm3	9	22.5	0.125	-1.56E+00	2.10E-01	-9.42E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	2.10E-01
n	1.100E-01		10	25	0.125	-1.73E+00	1.77E-01	-9.42E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	1.77E-01
i	5.925E-02		11	27.5	0.125	-1.90E+00	1.49E-01	-9.42E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	1.48E-01
K	1.150E+00	m/d	12	30	0.125	-2.08E+00	1.25E-01	-9.42E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	1.24E-01
x	5.000E+01	m	13	32.5	0.125	-2.25E+00	1.05E-01	-9.42E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	1.04E-01
z	0.000E+00	m	14	35	0.125	-2.42E+00	8.86E-02	-9.42E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	8.76E-02
y	0.000E+00	m	15	37.5	0.125	-2.60E+00	7.45E-02	-9.42E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	7.34E-02
t	1.000E+99	days	16	40	0.125	-2.77E+00	6.26E-02	-9.42E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	6.15E-02
ax	5.000E+00	m	17	42.5	0.125	-2.94E+00	5.27E-02	-9.42E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	5.15E-02
az	5.000E-01	m	18	45	0.125	-3.12E+00	4.43E-02	-9.42E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	4.31E-02
ay	5.000E-02	m	19	47.5	0.125	-3.29E+00	3.73E-02	-9.42E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	3.61E-02
			20	50	0.125	-3.46E+00	3.13E-02	-9.42E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	3.02E-02



Calc	Value																
			Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
v	6.19E-01	m/d		m														
Rc	1.00E+00		1	2.5	0.125	-1.73E-01	8.41E-01	-9.42E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	8.41E-01
u	6.19E-01	m/d	2	5	0.125	-3.46E-01	7.07E-01	-9.42E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	7.07E-01
			3	7.5	0.125	-5.19E-01	5.95E-01	-9.42E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	5.95E-01
			4	10	0.125	-6.93E-01	5.00E-01	-9.42E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	5.00E-01
			5	12.5	0.125	-8.66E-01	4.21E-01	-9.42E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	4.21E-01
			6	15	0.125	-1.04E+00	3.54E-01	-9.42E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	3.54E-01
			7	17.5	0.125	-1.21E+00	2.98E-01	-9.42E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	2.97E-01
			8	20	0.125	-1.39E+00	2.50E-01	-9.42E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	2.50E-01
			9	22.5	0.125	-1.56E+00	2.10E-01	-9.42E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	2.10E-01
			10	25	0.125	-1.73E+00	1.77E-01	-9.42E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	1.77E-01
			11	27.5	0.125	-1.90E+00	1.49E-01	-9.42E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	1.48E-01
			12	30	0.125	-2.08E+00	1.25E-01	-9.42E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	1.24E-01
			13	32.5	0.125	-2.25E+00	1.05E-01	-9.42E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	1.04E-01
			14	35	0.125	-2.42E+00	8.86E-02	-9.42E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	8.76E-02
			15	37.5	0.125	-2.60E+00	7.45E-02	-9.42E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	7.34E-02
			16	40	0.125	-2.77E+00	6.26E-02	-9.42E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	6.15E-02
			17	42.5	0.125	-2.94E+00	5.27E-02	-9.42E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	5.16E-02
			18	45	0.125	-3.12E+00	4.43E-02	-9.42E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	4.32E-02
			19	47.5	0.125	-3.29E+00	3.73E-02	-9.42E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	3.62E-02
			20	50	0.125	-3.46E+00	3.13E-02	-9.42E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	3.03E-02



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

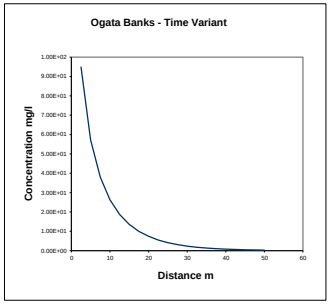
Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.39E-03	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

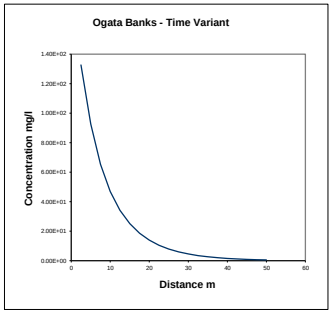
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	9.49E+01
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	5.72E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	3.79E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	2.63E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	1.88E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	1.36E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	1.00E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	7.41E+00
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	5.53E+00
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	4.15E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	3.13E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	2.37E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	1.80E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	1.37E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	1.04E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	7.95E-01
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	6.07E-01
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	4.65E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.57E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	2.74E-01



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-2.3E-01	7.9E-01	-4.4E+48	2.000	7.3E-01	2.1E+00	4.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.33E+02
2	5	21.975	-4.7E-01	6.3E-01	-4.4E+48	2.000	1.5E+00	4.3E+00	4.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	9.26E+01
3	7.5	21.975	-7.0E-01	4.9E-01	-4.4E+48	2.000	2.2E+00	9.1E+00	4.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	6.53E+01
4	10	21.975	-9.4E-01	3.9E-01	-4.4E+48	2.000	2.9E+00	1.9E+01	4.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	4.69E+01
5	12.5	21.975	-1.2E+00	3.1E-01	-4.4E+48	2.000	3.7E+00	3.9E+01	4.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	3.42E+01
6	15	21.975	-1.4E+00	2.4E-01	-4.4E+48	2.000	4.4E+00	8.2E+01	4.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	2.51E+01
7	17.5	21.975	-1.6E+00	1.9E-01	-4.4E+48	2.000	5.1E+00	1.7E+02	4.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	1.87E+01
8	20	21.975	-1.9E+00	1.5E-01	-4.4E+48	2.000	5.9E+00	3.6E+02	4.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	1.40E+01
9	22.5	21.975	-2.1E+00	1.2E-01	-4.4E+48	2.000	6.6E+00	7.5E+02	4.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	1.05E+01
10	25	21.975	-2.3E+00	9.5E-02	-4.4E+48	2.000	7.3E+00	1.6E+03	4.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.91E+00
11	27.5	21.975	-2.6E+00	7.5E-02	-4.4E+48	2.000	8.1E+00	3.2E+03	4.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	5.99E+00
12	30	21.975	-2.8E+00	6.0E-02	-4.4E+48	2.000	8.8E+00	6.8E+03	4.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	4.55E+00
13	32.5	21.975	-3.1E+00	4.7E-02	-4.4E+48	2.000	9.6E+00	1.4E+04	4.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	3.46E+00
14	35	21.975	-3.3E+00	3.7E-02	-4.4E+48	2.000	1.0E+01	2.9E+04	4.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	2.64E+00
15	37.5	21.975	-3.5E+00	2.9E-02	-4.4E+48	2.000	1.1E+01	6.1E+04	4.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	2.01E+00
16	40	21.975	-3.8E+00	2.3E-02	-4.4E+48	2.000	1.2E+01	1.3E+05	4.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	1.54E+00
17	42.5	21.975	-4.0E+00	1.8E-02	-4.4E+48	2.000	1.2E+01	2.7E+05	4.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	1.18E+00
18	45	21.975	-4.2E+00	1.5E-02	-4.4E+48	2.000	1.3E+01	5.6E+05	4.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	9.05E-01
19	47.5	21.975	-4.5E+00	1.2E-02	-4.4E+48	2.000	1.4E+01	1.2E+06	4.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.95E-01
20	50	21.975	-4.7E+00	9.1E-03	-4.4E+48	2.000	1.5E+01	2.4E+06	4.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.34E-01

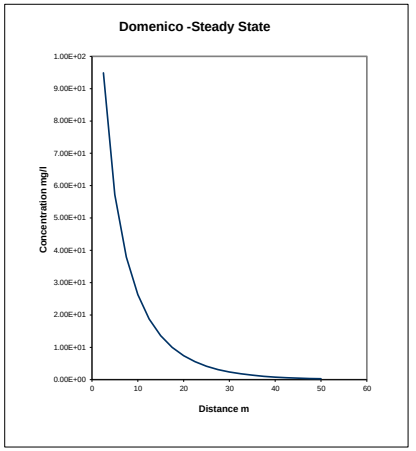


Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Tolune			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
Input	**Value**	**Units**														
C_T	0.074	mg/l	1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	9.49E+01
			2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	5.72E+01
			3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	3.79E+01
Co	1.76E+02	mg/l	4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	2.63E+01
λ	1.39E-03	$days^{-1}$	5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	1.88E+01
Sz	3.00E+01	m	6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	1.36E+01
Sy	1.00E+00	m	7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	1.00E+01
Kd	1.90E+00	l/kg	8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	7.41E+00
ρ	2.35E+00	g/cm3	9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	5.53E+00
n	1.10E-01		10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	4.15E+00
i	4.00E-02		11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
K	1.15E+00	m/d	12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	2.37E+00
x	5.00E+01	m	13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	1.80E+00
z	0.00E+00	m	14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	1.37E+00
y	0.00E+00	m	15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	1.04E+00
			16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	7.95E-01
ax	5.00E+00	m	17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	6.07E-01
az	5.00E-01	m	18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	4.65E-01
ay	5.00E-02	m	19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.57E-01
			20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	2.74E-01

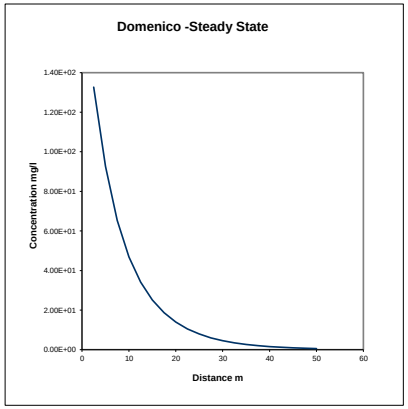


Vertical dispersion optio Simulate vertical dispersion in 1 direction

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

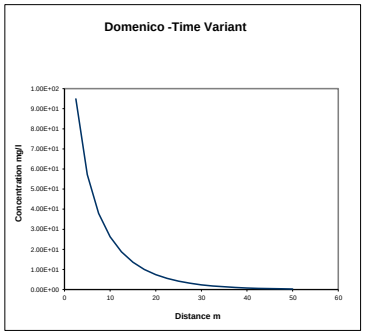
Calc	Value			X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
v	4.18E-01	m/d														
Rc	4.15E+01															
u	1.01E-02	m/d	1	2.5	43.95	-2.35E-01	7.91E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.33E+02
			2	5	43.95	-4.70E-01	6.25E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	9.26E+01
			3	7.5	43.95	-7.05E-01	4.94E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	6.53E+01
			4	10	43.95	-9.40E-01	3.91E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	4.69E+01
			5	12.5	43.95	-1.17E+00	3.09E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	3.42E+01
			6	15	43.95	-1.41E+00	2.44E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	2.51E+01
			7	17.5	43.95	-1.64E+00	1.93E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	1.87E+01
			8	20	43.95	-1.88E+00	1.53E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	1.40E+01
			9	22.5	43.95	-2.11E+00	1.21E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
			10	25	43.95	-2.35E+00	9.54E-02	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.91E+00
			11	27.5	43.95	-2.58E+00	7.54E-02	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	5.99E+00
			12	30	43.95	-2.82E+00	5.96E-02	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	4.55E+00
			13	32.5	43.95	-3.05E+00	4.72E-02	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	3.46E+00
			14	35	43.95	-3.29E+00	3.73E-02	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
			15	37.5	43.95	-3.52E+00	2.95E-02	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	2.01E+00
			16	40	43.95	-3.76E+00	2.33E-02	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	1.54E+00
			17	42.5	43.95	-3.99E+00	1.84E-02	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	1.18E+00
			18	45	43.95	-4.23E+00	1.46E-02	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	9.05E-01
			19	47.5	43.95	-4.46E+00	1.15E-02	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.95E-01
			20	50	43.95	-4.70E+00	9.11E-03	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.34E-01



Date:	13.07.2021
Version:	1

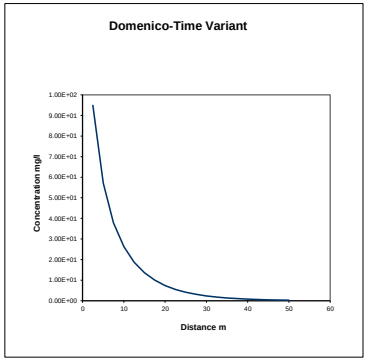
DOMENICO (TIME VARIANT)

Contaminant	Tolune																	
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)															
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	9.49E+01
			2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	5.72E+01
			3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	3.79E+01
Co	1.76E+02	mg/l	4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	2.63E+01
λ	1.39E-03	$days^{-1}$	5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	1.88E+01
Sz	3.00E+01	m	6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	1.36E+01
Sy	1.00E+00	m	7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	1.00E+01
Kd	1.90E+00	l/kg	8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	7.41E+00
ρ	2.35E+00	g/cm3	9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	5.53E+00
n	1.10E-01		10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	4.15E+00
i	4.00E-02		11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	3.13E+00
K	1.15E+00	m/d	12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	2.37E+00
x	5.00E+01	m	13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	1.80E+00
z	0.00E+00	m	14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	1.37E+00
y	0.00E+00	m	15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	1.04E+00
t	1.00E+100	days	16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	7.95E-01
ax	5.00E+00	m	17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	6.07E-01
az	5.00E-01	m	18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	4.65E-01
ay	5.00E-02	m	19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.57E-01
			20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	2.74E-01



Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value																	
			Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT															
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
v	4.18E-01	m/d		m														
Rc	4.15E+01		1	2.5	21.975	-2.35E-01	7.91E-01	-4.35E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.33E+02
u	1.01E-02	m/d	2	5	21.975	-4.70E-01	6.25E-01	-4.35E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	9.26E+01
			3	7.5	21.975	-7.05E-01	4.94E-01	-4.35E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	6.53E+01
			4	10	21.975	-9.40E-01	3.91E-01	-4.35E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	4.69E+01
			5	12.5	21.975	-1.17E+00	3.09E-01	-4.35E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	3.42E+01
			6	15	21.975	-1.41E+00	2.44E-01	-4.35E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	2.51E+01
			7	17.5	21.975	-1.64E+00	1.93E-01	-4.35E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	1.87E+01
			8	20	21.975	-1.88E+00	1.53E-01	-4.35E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	1.40E+01
			9	22.5	21.975	-2.11E+00	1.21E-01	-4.35E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	1.05E+01
			10	25	21.975	-2.35E+00	9.54E-02	-4.35E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.91E+00
			11	27.5	21.975	-2.58E+00	7.54E-02	-4.35E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	5.99E+00
			12	30	21.975	-2.82E+00	5.96E-02	-4.35E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	4.55E+00
			13	32.5	21.975	-3.05E+00	4.72E-02	-4.35E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	3.46E+00
			14	35	21.975	-3.29E+00	3.73E-02	-4.35E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	2.64E+00
			15	37.5	21.975	-3.52E+00	2.95E-02	-4.35E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	2.01E+00
			16	40	21.975	-3.76E+00	2.33E-02	-4.35E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	1.54E+00
			17	42.5	21.975	-3.99E+00	1.84E-02	-4.35E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	1.18E+00
			18	45	21.975	-4.23E+00	1.46E-02	-4.35E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	9.05E-01
			19	47.5	21.975	-4.46E+00	1.15E-02	-4.35E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.95E-01
			20	50	21.975	-4.70E+00	9.11E-03	-4.35E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.34E-01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Tolune			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	2.38E+02	days	R2174c-R10-App A
Calculated decay rate	λ	2.91E-03	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	2.91E-03	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	7.68E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.30E+00**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Remedial Targets

Level 3 Remedial Target	**2.97E-01**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	6.04E-01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**50**	**m**	
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**7.68E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	0.00E+00	fraction
Organic carbon partition coefficient	Koc	0.00E+00	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	0.00E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

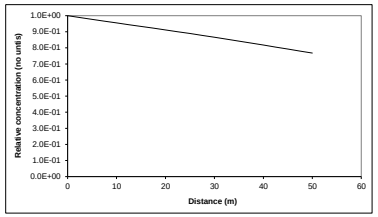
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	9.89E-01	8.51E+00
5.0	9.77E-01	8.41E+00
7.5	9.66E-01	8.32E+00
10.0	9.55E-01	8.22E+00
12.5	9.44E-01	8.13E+00
15.0	9.33E-01	8.03E+00
17.5	9.22E-01	7.94E+00
20.0	9.11E-01	7.84E+00
22.5	9.00E-01	7.75E+00
25.0	8.89E-01	7.65E+00
27.5	8.78E-01	7.55E+00
30.0	8.66E-01	7.45E+00
32.5	8.54E-01	7.35E+00
35.0	8.42E-01	7.25E+00
37.5	8.30E-01	7.14E+00
40.0	8.17E-01	7.03E+00
42.5	8.05E-01	6.93E+00
45.0	7.93E-01	6.82E+00
47.5	7.80E-01	6.71E+00
50.0	7.68E-01	6.61E+00

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

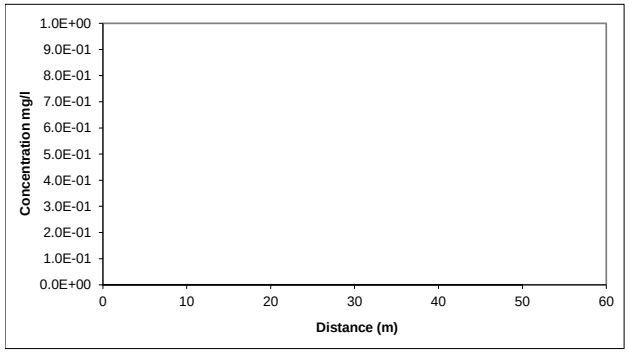
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.30E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	2.38E+02	days	R2174c-R10-App A
Calculated decay rate	λ	2.91E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	7.01E-05	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	4.19E+01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**4.20E+00**	

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

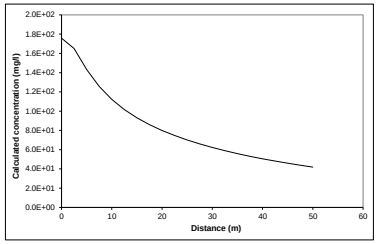
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.65E+02
5.0	1.43E+02
7.5	1.26E+02
10.0	1.12E+02
12.5	1.02E+02
15.0	9.31E+01
17.5	8.60E+01
20.0	7.99E+01
22.5	7.47E+01
25.0	7.01E+01
27.5	6.60E+01
30.0	6.23E+01
32.5	5.89E+01
35.0	5.59E+01
37.5	5.31E+01
40.0	5.05E+01
42.5	4.81E+01
45.0	4.59E+01
47.5	4.38E+01
50.0	4.19E+01

Remedial Targets

Remedial Target		**3.11E-01**	**mg/l**
Domenico - Steady state			
Distance to compliance point		**50**	**m**
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**4.19E+01**	**mg/l**

For comparison with measured groundwater concentration.

Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Tolune**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 1.90E+00 l/kg

Calculated Remedial Target 1.51E-01 mg/kg for Tolune

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

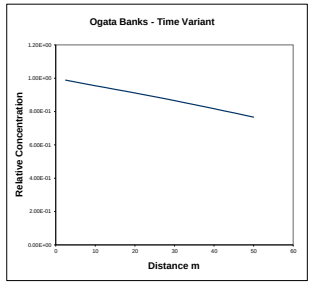
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
A	2.00E+03	m3/d m2 m3/d	Calculation based on observed contaminant concentration	#DIV/0!
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	2.912E-03	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

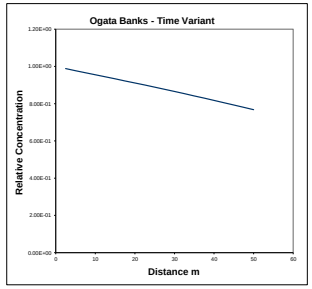
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.15E-02	9.89E-01	-5.82E+48	2	5.11E-01	1.67E+00	5.82E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.89E-01
2	5	0.13	-2.30E-02	9.77E-01	-5.82E+48	2	1.02E+00	2.78E+00	5.82E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.77E-01
3	7.5	0.13	-3.45E-02	9.66E-01	-5.82E+48	2	1.53E+00	4.64E+00	5.82E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.66E-01
4	10	0.13	-4.60E-02	9.55E-01	-5.82E+48	2	2.05E+00	7.74E+00	5.82E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	9.55E-01
5	12.5	0.13	-5.74E-02	9.44E-01	-5.82E+48	2	2.56E+00	1.29E+01	5.82E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	9.44E-01
6	15	0.13	-6.89E-02	9.33E-01	-5.82E+48	2	3.07E+00	2.15E+01	5.82E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	9.33E-01
7	17.5	0.13	-8.04E-02	9.23E-01	-5.82E+48	2	3.58E+00	3.59E+01	5.82E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	9.22E-01
8	20	0.13	-9.19E-02	9.12E-01	-5.82E+48	2	4.09E+00	5.99E+01	5.82E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	9.11E-01
9	22.5	0.13	-1.03E-01	9.02E-01	-5.82E+48	2	4.60E+00	9.98E+01	5.82E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	9.00E-01
10	25	0.13	-1.15E-01	8.91E-01	-5.82E+48	2	5.11E+00	1.66E+02	5.82E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	8.89E-01
11	27.5	0.13	-1.26E-01	8.81E-01	-5.82E+48	2	5.63E+00	2.78E+02	5.82E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	8.78E-01
12	30	0.13	-1.38E-01	8.71E-01	-5.82E+48	2	6.14E+00	4.63E+02	5.82E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	8.66E-01
13	32.5	0.13	-1.49E-01	8.61E-01	-5.82E+48	2	6.65E+00	7.72E+02	5.82E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	8.54E-01
14	35	0.13	-1.61E-01	8.51E-01	-5.82E+48	2	7.16E+00	1.29E+03	5.82E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	8.42E-01
15	37.5	0.13	-1.72E-01	8.42E-01	-5.82E+48	2	7.67E+00	2.15E+03	5.82E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	8.29E-01
16	40	0.13	-1.84E-01	8.32E-01	-5.82E+48	2	8.18E+00	3.58E+03	5.82E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	8.17E-01
17	42.5	0.13	-1.95E-01	8.23E-01	-5.82E+48	2	8.70E+00	5.97E+03	5.82E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	8.04E-01
18	45	0.13	-2.07E-01	8.13E-01	-5.82E+48	2	9.21E+00	9.96E+03	5.82E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	7.92E-01
19	47.5	0.13	-2.18E-01	8.04E-01	-5.82E+48	2	9.72E+00	1.66E+04	5.82E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	7.79E-01
20	50	0.13	-2.30E-01	7.95E-01	-5.82E+48	2	1.02E+01	2.77E+04	5.82E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	7.66E-01



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	-1.15E-02	9.89E-01	-5.82E+48	2	5.11E-01	1.67E+00	5.82E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.89E-01
2	5	0.13	-2.30E-02	9.77E-01	-5.82E+48	2	1.02E+00	2.78E+00	5.82E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.77E-01
3	7.5	0.13	-3.45E-02	9.66E-01	-5.82E+48	2	1.53E+00	4.64E+00	5.82E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.66E-01
4	10	0.13	-4.60E-02	9.55E-01	-5.82E+48	2	2.05E+00	7.74E+00	5.82E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	9.55E-01
5	12.5	0.13	-5.74E-02	9.44E-01	-5.82E+48	2	2.56E+00	1.29E+01	5.82E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	9.44E-01
6	15	0.13	-6.89E-02	9.33E-01	-5.82E+48	2	3.07E+00	2.15E+01	5.82E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	9.33E-01
7	17.5	0.13	-8.04E-02	9.23E-01	-5.82E+48	2	3.58E+00	3.59E+01	5.82E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	9.22E-01
8	20	0.13	-9.19E-02	9.12E-01	-5.82E+48	2	4.09E+00	5.99E+01	5.82E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	9.11E-01
9	22.5	0.13	-1.03E-01	9.02E-01	-5.82E+48	2	4.60E+00	9.98E+01	5.82E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	9.00E-01
10	25	0.13	-1.15E-01	8.91E-01	-5.82E+48	2	5.11E+00	1.66E+02	5.82E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	8.89E-01
11	27.5	0.13	-1.26E-01	8.81E-01	-5.82E+48	2	5.63E+00	2.78E+02	5.82E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	8.78E-01
12	30	0.13	-1.38E-01	8.71E-01	-5.82E+48	2	6.14E+00	4.63E+02	5.82E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	8.66E-01
13	32.5	0.13	-1.49E-01	8.61E-01	-5.82E+48	2	6.65E+00	7.72E+02	5.82E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	8.54E-01
14	35	0.13	-1.61E-01	8.51E-01	-5.82E+48	2	7.16E+00	1.29E+03	5.82E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	8.42E-01
15	37.5	0.13	-1.72E-01	8.42E-01	-5.82E+48	2	7.67E+00	2.15E+03	5.82E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	8.30E-01
16	40	0.13	-1.84E-01	8.32E-01	-5.82E+48	2	8.18E+00	3.58E+03	5.82E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	8.17E-01
17	42.5	0.13	-1.95E-01	8.23E-01	-5.82E+48	2	8.70E+00	5.97E+03	5.82E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	8.05E-01
18	45	0.13	-2.07E-01	8.13E-01	-5.82E+48	2	9.21E+00	9.96E+03	5.82E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	7.93E-01
19	47.5	0.13	-2.18E-01	8.04E-01	-5.82E+48	2	9.72E+00	1.66E+04	5.82E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	7.80E-01
20	50	0.13	-2.30E-01	7.95E-01	-5.82E+48	2	1.02E+01	2.77E+04	5.82E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	7.68E-01



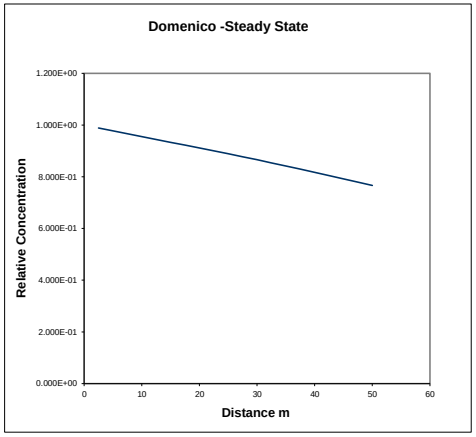
Date:	13.07.2021
Version:	1

Contaminant	Toluene	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	2.912E-03	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.15E-02	9.89E-01	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.886E-01
2	5	0.25	-2.30E-02	9.77E-01	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.773E-01
3	7.5	0.25	-3.45E-02	9.66E-01	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.661E-01
4	10	0.25	-4.60E-02	9.55E-01	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	9.551E-01
5	12.5	0.25	-5.74E-02	9.44E-01	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	9.442E-01
6	15	0.25	-6.89E-02	9.33E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	9.333E-01
7	17.5	0.25	-8.04E-02	9.23E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	9.224E-01
8	20	0.25	-9.19E-02	9.12E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	9.115E-01
9	22.5	0.25	-1.03E-01	9.02E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	9.003E-01
10	25	0.25	-1.15E-01	8.91E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	8.890E-01
11	27.5	0.25	-1.26E-01	8.81E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	8.775E-01
12	30	0.25	-1.38E-01	8.71E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	8.658E-01
13	32.5	0.25	-1.49E-01	8.61E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	8.538E-01
14	35	0.25	-1.61E-01	8.51E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	8.417E-01
15	37.5	0.25	-1.72E-01	8.42E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	8.294E-01
16	40	0.25	-1.84E-01	8.32E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	8.170E-01
17	42.5	0.25	-1.95E-01	8.23E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	8.044E-01
18	45	0.25	-2.07E-01	8.13E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	7.918E-01
19	47.5	0.25	-2.18E-01	8.04E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	7.791E-01
20	50	0.25	-2.30E-01	7.95E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	7.664E-01

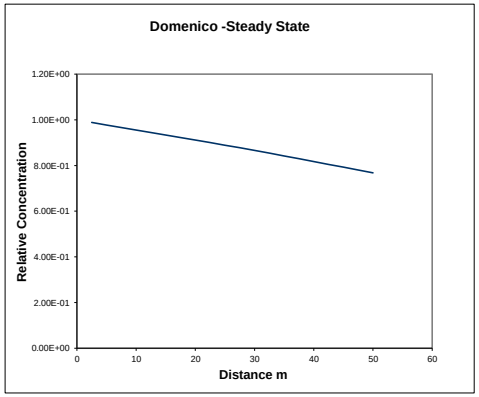


Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

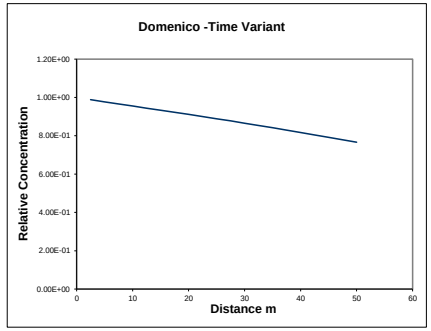
	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	-1.15E-02	9.89E-01	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.89E-01
2	5	0.25	-2.30E-02	9.77E-01	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.77E-01
3	7.5	0.25	-3.45E-02	9.66E-01	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.66E-01
4	10	0.25	-4.60E-02	9.55E-01	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	9.55E-01
5	12.5	0.25	-5.74E-02	9.44E-01	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	9.44E-01
6	15	0.25	-6.89E-02	9.33E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	9.33E-01
7	17.5	0.25	-8.04E-02	9.23E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	9.22E-01
8	20	0.25	-9.19E-02	9.12E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	9.11E-01
9	22.5	0.25	-1.03E-01	9.02E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	9.00E-01
10	25	0.25	-1.15E-01	8.91E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	8.89E-01
11	27.5	0.25	-1.26E-01	8.81E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	8.78E-01
12	30	0.25	-1.38E-01	8.71E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	8.66E-01
13	32.5	0.25	-1.49E-01	8.61E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	8.54E-01
14	35	0.25	-1.61E-01	8.51E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	8.42E-01
15	37.5	0.25	-1.72E-01	8.42E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	8.30E-01
16	40	0.25	-1.84E-01	8.32E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	8.17E-01
17	42.5	0.25	-1.95E-01	8.23E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	8.05E-01
18	45	0.25	-2.07E-01	8.13E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	7.93E-01
19	47.5	0.25	-2.18E-01	8.04E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	7.80E-01
20	50	0.25	-2.30E-01	7.95E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	7.68E-01



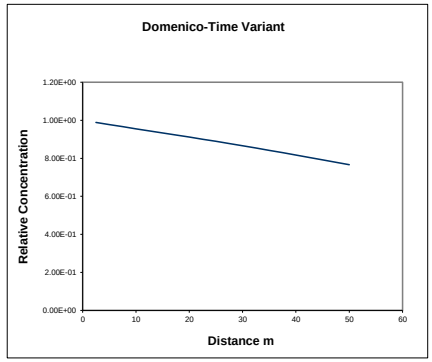
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Tolune																
			Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
Input	**Value**	**Units**		m														
C_T	0.074	mg/l	1	2.5	0.125	-1.15E-02	9.89E-01	-5.82E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	9.89E-01
DF	3.0774		2	5	0.125	-2.30E-02	9.77E-01	-5.82E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	9.77E-01
			3	7.5	0.125	-3.45E-02	9.66E-01	-5.82E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	9.66E-01
			4	10	0.125	-4.60E-02	9.55E-01	-5.82E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	9.55E-01
λ	2.912E-03	$days^{-1}$	5	12.5	0.125	-5.74E-02	9.44E-01	-5.82E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	9.44E-01
Sz	3.000E+01	m	6	15	0.125	-6.89E-02	9.33E-01	-5.82E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	9.33E-01
Sy	1.400E+01	m	7	17.5	0.125	-8.04E-02	9.23E-01	-5.82E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	9.22E-01
Kd	0.000E+00	l/kg	8	20	0.125	-9.19E-02	9.12E-01	-5.82E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	9.11E-01
ρ	2.350E+00	g/cm3	9	22.5	0.125	-1.03E-01	9.02E-01	-5.82E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	9.00E-01
n	1.100E-01		10	25	0.125	-1.15E-01	8.91E-01	-5.82E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	8.89E-01
i	5.925E-02		11	27.5	0.125	-1.26E-01	8.81E-01	-5.82E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	8.78E-01
K	1.150E+00	m/d	12	30	0.125	-1.38E-01	8.71E-01	-5.82E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	8.66E-01
x	5.000E+01	m	13	32.5	0.125	-1.49E-01	8.61E-01	-5.82E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	8.54E-01
z	0.000E+00	m	14	35	0.125	-1.61E-01	8.51E-01	-5.82E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	8.42E-01
y	0.000E+00	m	15	37.5	0.125	-1.72E-01	8.42E-01	-5.82E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	8.29E-01
t	1.000E+99	days	16	40	0.125	-1.84E-01	8.32E-01	-5.82E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	8.17E-01
ax	5.000E+00	m	17	42.5	0.125	-1.95E-01	8.23E-01	-5.82E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	8.04E-01
az	5.000E-01	m	18	45	0.125	-2.07E-01	8.13E-01	-5.82E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	7.92E-01
ay	5.000E-02	m	19	47.5	0.125	-2.18E-01	8.04E-01	-5.82E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	7.79E-01
			20	50	0.125	-2.30E-01	7.95E-01	-5.82E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	7.66E-01



Calc	Value																
			Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT														
				X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
v	6.19E-01	m/d		m														
Rc	1.00E+00		1	2.5	0.125	-1.15E-02	9.89E-01	-5.82E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	9.89E-01
u	6.19E-01	m/d	2	5	0.125	-2.30E-02	9.77E-01	-5.82E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	9.77E-01
			3	7.5	0.125	-3.45E-02	9.66E-01	-5.82E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	9.66E-01
			4	10	0.125	-4.60E-02	9.55E-01	-5.82E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	9.55E-01
			5	12.5	0.125	-5.74E-02	9.44E-01	-5.82E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	9.44E-01
			6	15	0.125	-6.89E-02	9.33E-01	-5.82E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	9.33E-01
			7	17.5	0.125	-8.04E-02	9.23E-01	-5.82E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	9.22E-01
			8	20	0.125	-9.19E-02	9.12E-01	-5.82E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	9.11E-01
			9	22.5	0.125	-1.03E-01	9.02E-01	-5.82E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	9.00E-01
			10	25	0.125	-1.15E-01	8.91E-01	-5.82E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	8.89E-01
			11	27.5	0.125	-1.26E-01	8.81E-01	-5.82E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	8.78E-01
			12	30	0.125	-1.38E-01	8.71E-01	-5.82E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	8.66E-01
			13	32.5	0.125	-1.49E-01	8.61E-01	-5.82E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	8.54E-01
			14	35	0.125	-1.61E-01	8.51E-01	-5.82E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	8.42E-01
			15	37.5	0.125	-1.72E-01	8.42E-01	-5.82E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	8.30E-01
			16	40	0.125	-1.84E-01	8.32E-01	-5.82E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	8.17E-01
			17	42.5	0.125	-1.95E-01	8.23E-01	-5.82E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	8.05E-01
			18	45	0.125	-2.07E-01	8.13E-01	-5.82E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	7.93E-01
			19	47.5	0.125	-2.18E-01	8.04E-01	-5.82E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	7.80E-01
			20	50	0.125	-2.30E-01	7.95E-01	-5.82E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	7.68E-01



Date:	13.07.2021
Version:	1

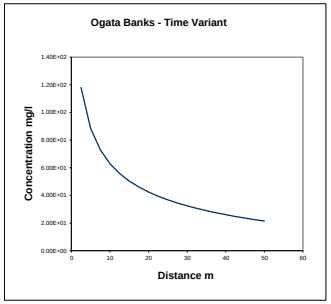
OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	7.01E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option Simulate vertical dispersion in 1 direction

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

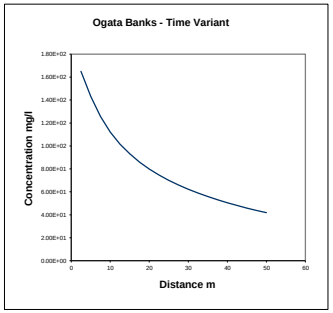
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-1.7E-02	9.8E-01	-2.4E+48	2.000	5.2E-01	1.7E+00	2.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.18E+02
2	5	21.975	-3.4E-02	9.7E-01	-2.4E+48	2.000	1.0E+00	2.8E+00	2.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	8.85E+01
3	7.5	21.975	-5.1E-02	9.5E-01	-2.4E+48	2.000	1.6E+00	4.7E+00	2.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	7.29E+01
4	10	21.975	-6.7E-02	9.3E-01	-2.4E+48	2.000	2.1E+00	7.9E+00	2.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	6.29E+01
5	12.5	21.975	-8.4E-02	9.2E-01	-2.4E+48	2.000	2.6E+00	1.3E+01	2.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	5.58E+01
6	15	21.975	-1.0E-01	9.0E-01	-2.4E+48	2.000	3.1E+00	2.2E+01	2.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	5.04E+01
7	17.5	21.975	-1.2E-01	8.9E-01	-2.4E+48	2.000	3.6E+00	3.7E+01	2.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	4.60E+01
8	20	21.975	-1.3E-01	8.7E-01	-2.4E+48	2.000	4.1E+00	6.2E+01	2.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	4.24E+01
9	22.5	21.975	-1.5E-01	8.6E-01	-2.4E+48	2.000	4.7E+00	1.0E+02	2.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	3.94E+01
10	25	21.975	-1.7E-01	8.4E-01	-2.4E+48	2.000	5.2E+00	1.8E+02	2.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	3.68E+01
11	27.5	21.975	-1.9E-01	8.3E-01	-2.4E+48	2.000	5.7E+00	2.9E+02	2.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	3.45E+01
12	30	21.975	-2.0E-01	8.2E-01	-2.4E+48	2.000	6.2E+00	4.9E+02	2.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	3.24E+01
13	32.5	21.975	-2.2E-01	8.0E-01	-2.4E+48	2.000	6.7E+00	8.3E+02	2.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	3.06E+01
14	35	21.975	-2.4E-01	7.9E-01	-2.4E+48	2.000	7.2E+00	1.4E+03	2.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	2.89E+01
15	37.5	21.975	-2.5E-01	7.8E-01	-2.4E+48	2.000	7.8E+00	2.3E+03	2.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	2.74E+01
16	40	21.975	-2.7E-01	7.6E-01	-2.4E+48	2.000	8.3E+00	3.9E+03	2.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	2.60E+01
17	42.5	21.975	-2.9E-01	7.5E-01	-2.4E+48	2.000	8.8E+00	6.5E+03	2.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	2.48E+01
18	45	21.975	-3.0E-01	7.4E-01	-2.4E+48	2.000	9.3E+00	1.1E+04	2.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	2.36E+01
19	47.5	21.975	-3.2E-01	7.3E-01	-2.4E+48	2.000	9.8E+00	1.8E+04	2.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	2.25E+01
20	50	21.975	-3.4E-01	7.1E-01	-2.4E+48	2.000	1.0E+01	3.1E+04	2.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	2.15E+01



Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	-1.7E-02	9.8E-01	-2.4E+48	2.000	5.2E-01	1.7E+00	2.4E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.65E+02
2	5	21.975	-3.4E-02	9.7E-01	-2.4E+48	2.000	1.0E+00	2.8E+00	2.4E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	1.43E+02
3	7.5	21.975	-5.1E-02	9.5E-01	-2.4E+48	2.000	1.6E+00	4.7E+00	2.4E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.26E+02
4	10	21.975	-6.7E-02	9.3E-01	-2.4E+48	2.000	2.1E+00	7.9E+00	2.4E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.12E+02
5	12.5	21.975	-8.4E-02	9.2E-01	-2.4E+48	2.000	2.6E+00	1.3E+01	2.4E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	1.02E+02
6	15	21.975	-1.0E-01	9.0E-01	-2.4E+48	2.000	3.1E+00	2.2E+01	2.4E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	9.31E+01
7	17.5	21.975	-1.2E-01	8.9E-01	-2.4E+48	2.000	3.6E+00	3.7E+01	2.4E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	8.60E+01
8	20	21.975	-1.3E-01	8.7E-01	-2.4E+48	2.000	4.1E+00	6.2E+01	2.4E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	7.99E+01
9	22.5	21.975	-1.5E-01	8.6E-01	-2.4E+48	2.000	4.7E+00	1.0E+02	2.4E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	7.47E+01
10	25	21.975	-1.7E-01	8.4E-01	-2.4E+48	2.000	5.2E+00	1.8E+02	2.4E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	7.01E+01
11	27.5	21.975	-1.9E-01	8.3E-01	-2.4E+48	2.000	5.7E+00	2.9E+02	2.4E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	6.60E+01
12	30	21.975	-2.0E-01	8.2E-01	-2.4E+48	2.000	6.2E+00	4.9E+02	2.4E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	6.23E+01
13	32.5	21.975	-2.2E-01	8.0E-01	-2.4E+48	2.000	6.7E+00	8.3E+02	2.4E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	5.89E+01
14	35	21.975	-2.4E-01	7.9E-01	-2.4E+48	2.000	7.2E+00	1.4E+03	2.4E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	5.59E+01
15	37.5	21.975	-2.5E-01	7.8E-01	-2.4E+48	2.000	7.8E+00	2.3E+03	2.4E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	5.31E+01
16	40	21.975	-2.7E-01	7.6E-01	-2.4E+48	2.000	8.3E+00	3.9E+03	2.4E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	5.05E+01
17	42.5	21.975	-2.9E-01	7.5E-01	-2.4E+48	2.000	8.8E+00	6.5E+03	2.4E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	4.81E+01
18	45	21.975	-3.0E-01	7.4E-01	-2.4E+48	2.000	9.3E+00	1.1E+04	2.4E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	4.59E+01
19	47.5	21.975	-3.2E-01	7.3E-01	-2.4E+48	2.000	9.8E+00	1.8E+04	2.4E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	4.38E+01
20	50	21.975	-3.4E-01	7.1E-01	-2.4E+48	2.000	1.0E+01	3.1E+04	2.4E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	4.19E+01



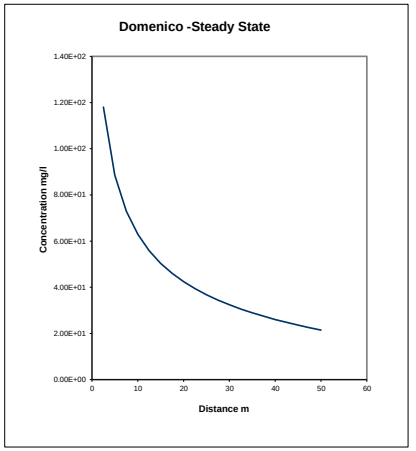
Date:	13.07.2021
Version:	1

DOMENICO (STEADY STATE)

Contaminant	Tolune		
Input	**Value**	**Units**	
C_T	0.074	mg/l	
Co	1.76E+02	mg/l	
λ	7.01E-05	days^{-1}	
Sz	3.00E+01	m	
Sy	1.00E+00	m	
Kd	1.90E+00	l/kg	
ρ	2.35E+00	g/cm3	
n	1.10E-01		
i	4.00E-02		
K	1.15E+00	m/d	
x	5.00E+01	m	
z	0.00E+00	m	
y	0.00E+00	m	
ax	5.00E+00	m	
az	5.00E-01	m	
ay	5.00E-02	m	

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	-1.68E-02	9.83E-01	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.18E+02
2	5	43.95	-3.37E-02	9.67E-01	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	8.85E+01
3	7.5	43.95	-5.05E-02	9.51E-01	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	7.29E+01
4	10	43.95	-6.74E-02	9.35E-01	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	6.29E+01
5	12.5	43.95	-8.42E-02	9.19E-01	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	5.58E+01
6	15	43.95	-1.01E-01	9.04E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	5.04E+01
7	17.5	43.95	-1.18E-01	8.89E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	4.60E+01
8	20	43.95	-1.35E-01	8.74E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	4.24E+01
9	22.5	43.95	-1.52E-01	8.59E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	3.94E+01
10	25	43.95	-1.68E-01	8.45E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	3.68E+01
11	27.5	43.95	-1.85E-01	8.31E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	3.45E+01
12	30	43.95	-2.02E-01	8.17E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	3.24E+01
13	32.5	43.95	-2.19E-01	8.03E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	3.06E+01
14	35	43.95	-2.36E-01	7.90E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	2.89E+01
15	37.5	43.95	-2.53E-01	7.77E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	2.74E+01
16	40	43.95	-2.70E-01	7.64E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	2.60E+01
17	42.5	43.95	-2.86E-01	7.51E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	2.48E+01
18	45	43.95	-3.03E-01	7.38E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	2.36E+01
19	47.5	43.95	-3.20E-01	7.26E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	2.25E+01
20	50	43.95	-3.37E-01	7.14E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	2.15E+01



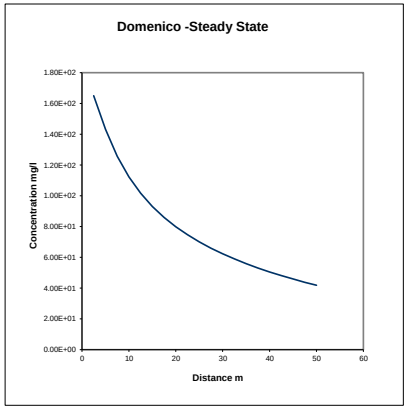
Vertical dispersion optio Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	-1.68E-02	9.83E-01	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.65E+02
2	5	43.95	-3.37E-02	9.67E-01	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	1.43E+02
3	7.5	43.95	-5.05E-02	9.51E-01	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.26E+02
4	10	43.95	-6.74E-02	9.35E-01	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.12E+02
5	12.5	43.95	-8.42E-02	9.19E-01	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	1.02E+02
6	15	43.95	-1.01E-01	9.04E-01	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	9.31E+01
7	17.5	43.95	-1.18E-01	8.89E-01	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	8.60E+01
8	20	43.95	-1.35E-01	8.74E-01	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	7.99E+01
9	22.5	43.95	-1.52E-01	8.59E-01	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	7.47E+01
10	25	43.95	-1.68E-01	8.45E-01	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	7.01E+01
11	27.5	43.95	-1.85E-01	8.31E-01	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	6.60E+01
12	30	43.95	-2.02E-01	8.17E-01	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	6.23E+01
13	32.5	43.95	-2.19E-01	8.03E-01	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	5.89E+01
14	35	43.95	-2.36E-01	7.90E-01	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	5.59E+01
15	37.5	43.95	-2.53E-01	7.77E-01	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	5.31E+01
16	40	43.95	-2.70E-01	7.64E-01	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	5.05E+01
17	42.5	43.95	-2.86E-01	7.51E-01	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	4.81E+01
18	45	43.95	-3.03E-01	7.38E-01	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	4.59E+01
19	47.5	43.95	-3.20E-01	7.26E-01	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	4.38E+01
20	50	43.95	-3.37E-01	7.14E-01	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	4.19E+01



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

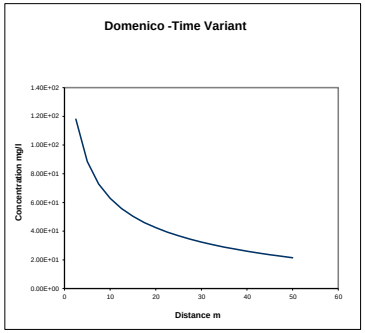
Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	7.01E-05	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

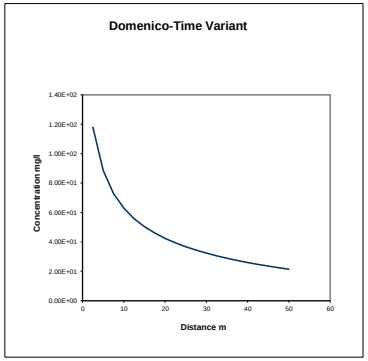
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-1.68E-02	9.83E-01	-2.39E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.18E+02
2	5	21.975	-3.37E-02	9.67E-01	-2.39E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	8.85E+01
3	7.5	21.975	-5.05E-02	9.51E-01	-2.39E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	7.29E+01
4	10	21.975	-6.74E-02	9.35E-01	-2.39E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	6.29E+01
5	12.5	21.975	-8.42E-02	9.19E-01	-2.39E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	5.58E+01
6	15	21.975	-1.01E-01	9.04E-01	-2.39E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	5.04E+01
7	17.5	21.975	-1.18E-01	8.89E-01	-2.39E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	4.60E+01
8	20	21.975	-1.35E-01	8.74E-01	-2.39E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	4.24E+01
9	22.5	21.975	-1.52E-01	8.59E-01	-2.39E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	3.94E+01
10	25	21.975	-1.68E-01	8.45E-01	-2.39E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	3.68E+01
11	27.5	21.975	-1.85E-01	8.31E-01	-2.39E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	3.45E+01
12	30	21.975	-2.02E-01	8.17E-01	-2.39E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	3.24E+01
13	32.5	21.975	-2.19E-01	8.03E-01	-2.39E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	3.06E+01
14	35	21.975	-2.36E-01	7.90E-01	-2.39E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	2.89E+01
15	37.5	21.975	-2.53E-01	7.77E-01	-2.39E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	2.74E+01
16	40	21.975	-2.70E-01	7.64E-01	-2.39E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	2.60E+01
17	42.5	21.975	-2.86E-01	7.51E-01	-2.39E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	2.48E+01
18	45	21.975	-3.03E-01	7.38E-01	-2.39E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	2.36E+01
19	47.5	21.975	-3.20E-01	7.26E-01	-2.39E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	2.25E+01
20	50	21.975	-3.37E-01	7.14E-01	-2.39E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	2.15E+01



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	-1.68E-02	9.83E-01	-2.39E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.65E+02
2	5	21.975	-3.37E-02	9.67E-01	-2.39E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	1.43E+02
3	7.5	21.975	-5.05E-02	9.51E-01	-2.39E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.26E+02
4	10	21.975	-6.74E-02	9.35E-01	-2.39E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.12E+02
5	12.5	21.975	-8.42E-02	9.19E-01	-2.39E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	1.02E+02
6	15	21.975	-1.01E-01	9.04E-01	-2.39E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	9.31E+01
7	17.5	21.975	-1.18E-01	8.89E-01	-2.39E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	8.60E+01
8	20	21.975	-1.35E-01	8.74E-01	-2.39E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	7.99E+01
9	22.5	21.975	-1.52E-01	8.59E-01	-2.39E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	7.47E+01
10	25	21.975	-1.68E-01	8.45E-01	-2.39E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	7.01E+01
11	27.5	21.975	-1.85E-01	8.31E-01	-2.39E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	6.60E+01
12	30	21.975	-2.02E-01	8.17E-01	-2.39E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	6.23E+01
13	32.5	21.975	-2.19E-01	8.03E-01	-2.39E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	5.89E+01
14	35	21.975	-2.36E-01	7.90E-01	-2.39E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	5.59E+01
15	37.5	21.975	-2.53E-01	7.77E-01	-2.39E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	5.31E+01
16	40	21.975	-2.70E-01	7.64E-01	-2.39E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	5.05E+01
17	42.5	21.975	-2.86E-01	7.51E-01	-2.39E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	4.81E+01
18	45	21.975	-3.03E-01	7.38E-01	-2.39E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	4.59E+01
19	47.5	21.975	-3.20E-01	7.26E-01	-2.39E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	4.38E+01
20	50	21.975	-3.37E-01	7.14E-01	-2.39E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	4.19E+01



Date:	13.07.2021
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions).

Details to be completed for each assessment				
Site Name:	Tetrosyl			
Site Address:	Becis Green Bury			
Completed by:	BJT			
Date:	13.07.2021		Version:	1
Contaminant	Tolune			
Target Concentration (C_T)	0.074	mg/l	Origin of C_T:	R2174C-R09 - Tier 1 Criteria

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Tolune**		
Target concentration	C_T	**0.074**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_w	2.63E-01	fraction	R2174c-R10-App A
Air filled soil porosity	θa	1.05E-01	fraction	R2174c-R10-App A
Bulk density of soil zone material	ρ	2.02E+00	g/cm^3	R2174c-R10-App A
Henry's Law constant	H	1.15E-01	dimensionless	R2174c-R10-App A
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	9.30E-03	fraction	R2174c-R10-App A
Organic carbon partition coefficient	Koc	2.04E+02	l/kg	R2174c-R10-App A
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.90E+00**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.074	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Tolune**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.074** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	3.10E-03	m/d	**R2174c-R10-App A**	
Area of contaminant source	A	2.00E+03	m^2	**R2174c-R10-App A**	Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.00E+02	m	**R2174c-R10-App A**	
Saturated aquifer thickness	da	1.40E+01	m	**R2174c-R10-App A**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	1.15E+00	m/d	**R2174c-R10-App A**	
Hydraulic gradient of water table	i	4.00E-02	fraction	**R2174c-R10-App A**	
Width of contaminant source perpendicular to groundwater flow	w	3.00E+01	m	**R2174c-R10-App A**	Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**R2174c-R10-App A**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Calculate**			
Enter mixing zone thickness	Mz		m		
Calculated mixing zone thickness	Mz	1.40E+01	m		

Calculated Parameters

Dilution Factor	**DF**	**3.08E+00**		
Level 2 Remedial Target		**2.28E-01**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		4.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	0.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		0.00E+00	mg/l	0

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Toluene		from Level 1
Target Concentration	C_T	0.074	mg/l	from Level 1
Dilution Factor	DF	3.08E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil concentration as mg/kg		
Enter soil concentration		53.9	mg/kg	
Half life for degradation of contaminant in water	$t_{1/2}$	1.00E+100	days	R2174c-R10-App A
Calculated decay rate	λ	6.93E-101	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	3.00E+01	m	from Level 2
Plume thickness in aquifer at source	Sy	1.40E+01	m	from Level 2
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	5.93E-02	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	1.15E+00	m/d	from Level 2
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	0.00E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.000	m	*see options*
Transverse dispersivity	az	0.500	m	*see options*
Vertical dispersivity	ay	0.050	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	6.19E-01	m/d
Retardation factor	Rf	1.00E+00	fraction
Decay rate used	λ	6.93E-101	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	5.93E-02	fraction
Rate of contaminant flow due to retardation	u	6.19E-01	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	9.66E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.04E+00**	**fraction**
Calculated soil leachate concentration	Co	2.65E+01	mg/l

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 0.00E+00 — fraction

Organic carbon partition coefficient — Koc — 0.00E+00 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg

Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg

pH value — pH

Acid dissociation constant — pKa

Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient — Kd — 0.00E+00 — l/kg

Define dispersivity (click brown cell and use pull down list)

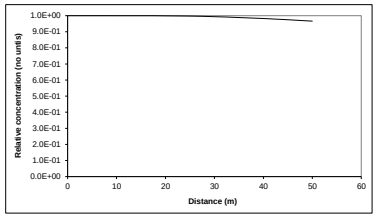
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	ax	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	az	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	ay	0.00E+00	5.00E-02	2.98E-02	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Calculated (relative) concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.61E+00
2.5	1.00E+00	8.61E+00
5.0	1.00E+00	8.61E+00
7.5	1.00E+00	8.61E+00
10.0	1.00E+00	8.61E+00
12.5	1.00E+00	8.61E+00
15.0	1.00E+00	8.61E+00
17.5	1.00E+00	8.60E+00
20.0	9.99E-01	8.60E+00
22.5	9.98E-01	8.59E+00
25.0	9.97E-01	8.58E+00
27.5	9.96E-01	8.57E+00
30.0	9.94E-01	8.55E+00
32.5	9.91E-01	8.53E+00
35.0	9.89E-01	8.51E+00
37.5	9.86E-01	8.48E+00
40.0	9.82E-01	8.45E+00
42.5	9.79E-01	8.42E+00
45.0	9.75E-01	8.39E+00
47.5	9.70E-01	8.35E+00
50.0	9.66E-01	8.32E+00

Remedial Targets

Level 3 Remedial Target		**2.36E-01**	**mg/l**	For comparison with measured pore water concentration.
Domenico - Steady state		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		4.80E-01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**50**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**9.66E-01**	**fraction**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

Only input required is Soil Contaminant Concentration

Input Parameters			
Soil contaminant concentration	C_0	0.00E+00	mg/kg

Level 1 Parameters

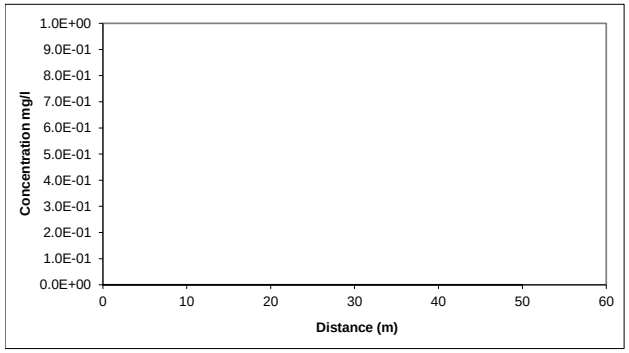
Water filled soil porosity	θ_w	2.63E-01	fraction
Air filled soil porosity	θa	1.05E-01	fraction
Bulk density	ρ	2.02E+00	g/cm^3
Henry's Law constant	H	1.15E-01	dimensionless
Soil water partition coefficient used in Level Assessment	Kd	1.90E+00	l/kg
Factor (partitioning between soil and water)		2.03E+00	dimensionless

Level 2 Parameters	**Dilution Factor**	DF	3.08E+00
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.04E+00

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
2.50	0.00E+00
5.00	0.00E+00
7.50	0.00E+00
10.00	0.00E+00
12.50	0.00E+00
15.00	0.00E+00
17.50	0.00E+00
20.00	0.00E+00
22.50	0.00E+00
25.00	0.00E+00
27.50	0.00E+00
30.00	0.00E+00
32.50	0.00E+00
35.00	0.00E+00
37.50	0.00E+00
40.00	0.00E+00
42.50	0.00E+00
45.00	0.00E+00
47.50	0.00E+00
50.00	0.00E+00

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Tolune		from Level 1
Target Concentration	C_T	7.40E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Domenico - Steady state — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.76E+02	mg/l	R2174c-R10-App A
Half life for degradation of contaminant in water	$t_{1/2}$	9.00E+99	days	R2174c-R10-App A
Calculated decay rate	λ	7.70E-101	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	3.00E+01	m	R2174c-R10-App A
Plume thickness at source	Sy	1.00E+00	m	R2174c-R10-App A
Saturated aquifer thickness	da	1.40E+01	m	R2174c-R10-App A
Bulk density of aquifer materials	ρ	2.35E+00	g/cm^3	R2174c-R10-App A
Effective porosity of aquifer	n	1.10E-01	fraction	R2174c-R10-App A
Hydraulic gradient	i	4.00E-02	fraction	R2174c-R10-App A
Hydraulic conductivity of aquifer	K	1.15E+00	m/d	R2174c-R10-App A
Distance to compliance point	x	5.00E+01	m	R2174c-R10-App A
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+00	l/kg	*see options*
Longitudinal dispersivity	ax	5.00E+00	m	*see options*
Transverse dispersivity	az	5.00E-01	m	*see options*
Vertical dispersivity	ay	5.00E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	4.18E-01	m/d
Retardation factor	Rf	4.15E+01	fraction
Decay rate used	λ	1.85E-102	d^{-1}
Rate of contaminant flow due to retardation	u	1.01E-02	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C_{ED}	5.86E+01	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	**AF**	**3.00E+00**	

Remedial Targets

Remedial Target		**2.22E-01**	**mg/l**	For comparison with measured groundwater concentration.
Domenico - Steady state				
Distance to compliance point		**50**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**5.86E+01**	**mg/l**	Domenico - Steady state

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	9.30E-03	fraction
Organic carbon partition coefficient	Koc	2.04E+02	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+00	l/kg

Define dispersivity (click brown cell and use pull down list)

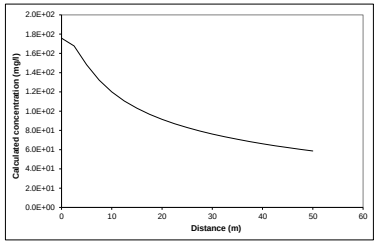
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	5.00E+00	2.98E+00	m
Transverse dispersivity	**az**	0.00E+00	5.00E-01	2.98E-01	m
Vertical dispersivity	**ay**	0.00E+00	5.00E-02	2.98E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Calculated concentrations for distance-concentration graph

Domenico - Steady state
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E+02
2.5	1.68E+02
5.0	1.48E+02
7.5	1.32E+02
10.0	1.20E+02
12.5	1.11E+02
15.0	1.03E+02
17.5	9.67E+01
20.0	9.14E+01
22.5	8.69E+01
25.0	8.29E+01
27.5	7.94E+01
30.0	7.62E+01
32.5	7.34E+01
35.0	7.08E+01
37.5	6.83E+01
40.0	6.61E+01
42.5	6.41E+01
45.0	6.21E+01
47.5	6.03E+01
50.0	5.86E+01

Porosity Calculator

These results are not carried through to any of the other worksheets

DRY BULK DENSITY DATA

Variable	Value	Unit	justification
Natural Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Dry Bulk Density	2.00	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.39	fraction	
Initial Saturation	106.92	*%*	
Total porosity	**0.281**	**fraction**	
Air Filled Porosity	**0.000**	**fraction**	
Water Filled Porosity	**0.281**	**fraction**	

WET BULK DENSITY DATA

Variable	Value	Unit	
Moisture Content	15.00	% wt	
Particle Density	2.78	tonnes/m^3	(Change this number only if you have specific information)
Actual (wet) Bulk Density (i.e. at natural MC)	2.02	tonnes/m^3	
Calculated Parameters			
Voids Ratio	0.58	fraction	
dry bulk density	1.76	tonnes/m^3	
Initial Saturation	71.57	*%*	
Total porosity	**0.368**	**fraction**	
Air Filled Porosity	**0.105**	**fraction**	
Water Filled Porosity	**0.263**	**fraction**	

Analytical solutions provided by David Hall, Golder Associates (UK) Ltd

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol		unit	justification
Hydraulic conductivity	K	0.00E+00	m/d	
Hydraulic gradient	i	0.00E+00	unitless	
Effective porosity of aquifer	n	0.00E+00	fraction	
Thickness of saturated aquifer	b	0.00E+00	m	
Width of aquifer perpendicular to flow	w	0.00E+00	m	
Distance to receptor	x	0.00E+00	m	
Bulk density of aquifer materials	ρ	0.00E+00	g/cm^3	
Soil-water partition co-efficient	Kd	0.00E+00	l/kg	
Retardation factor of pollutant	R	#DIV/0!		

Groundwater flow velocity	v(GW)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for groundwater to reach receptor	t(GW)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years
Rate of groundwater flow through aquifer	Q	0.00E+00	m^3/s	0.00E+00	m^3/day	0.00E+00	$m^3/year$

Contaminant flow velocity	v(contam)	#DIV/0!	m/s	#DIV/0!	m/day	#DIV/0!	m/year
Time for contaminant to reach receptor	t(contam)	#DIV/0!	seconds	#DIV/0!	days	#DIV/0!	years

Level 1 Calculation Sheet

Contaminant **Tolune**

Parameter	Value	Units
(carried over from input sheet)		
C_T	7.40E-02	mg/l
Kd	1.90E+00	l/kg
foc	9.30E-03	fraction
koc	2.04E+02	l/kg
θ_w	2.63E-01	fraction
θa	1.05E-01	fraction
ρ	2.02E+00	g/cm3
H	1.15E-01	dimensionless
Koc,n		l/kg
Koc,i		l/kg
pH		pH units
pKa		
foc (ionic)		fraction

Calculations (Refer toTable 4.3, R&D Publication 20)

Selected option Calculate for non-polar organic chemicals

calc calc Calc Kd l/kg

Calculation of partition coefficient for ionic organic chemical

Partition coefficient used in Level 1 Assessment 1.90E+00 l/kg

Calculated Remedial Target 1.51E-01 mg/kg for Tolune

Factor (partitioning between soil and water) 2.03E+00

Site being assessed:	Tetrosyl
Completed by:	BJT
Date:	13.07.2021
Version:	1

Level 2 Calculation Sheet

Contaminant **Toluene**

Site assessed:	Tetrosyl
Date:	13.07.2021
Version:	1

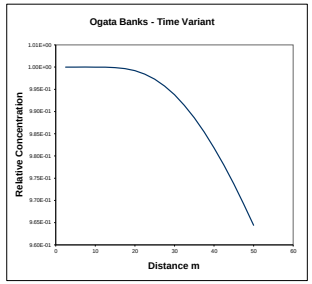
Parameter	Value	Units		
(carried over from input sheet)				
Mz	1.40E+01	m		
L	1.00E+02	m		
da	1.40E+01	m		Calculated
Inf	3.10E-03	m/d		Dilution Factor
K	1.15E+00	m/d		
i	4.00E-02		Calculation based on target concentration	3.08E+00
		m3/d		
A	2.00E+03	m2	Calculation based on observed contaminant concentration	#DIV/0!
		m3/d		
Cc	0.00E+00	mg/l		
C_T	7.40E-02	mg/l		
Cu	0.00E+00	mg/l		
w	3.00E+01	m		

OGATA BANKS SOLUTION

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	6.931E-101	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
t	1.000E+99	days
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

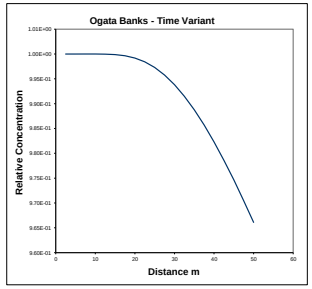
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.00E-01	1.65E+00	5.57E+48	0	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	1.00E+00
2	5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.00E+00	2.72E+00	5.57E+48	0	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	1.00E+00
3	7.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.50E+00	4.48E+00	5.57E+48	0	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.00E+00
4	10	0.13	0.00E+00	1.00E+00	-5.57E+48	2	2.00E+00	7.39E+00	5.57E+48	0	3.35E+00	0.999998	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	1.00E+00
5	12.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	2.50E+00	1.22E+01	5.57E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	4.43E+00	1	-4.43E+00	-1	1.00E+00
6	15	0.13	0.00E+00	1.00E+00	-5.57E+48	2	3.00E+00	2.01E+01	5.57E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	4.04E+00	1	-4.04E+00	-1	1.00E+00
7	17.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	3.50E+00	3.31E+01	5.57E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	3.74E+00	1	-3.74E+00	-1	1.00E+00
8	20	0.13	0.00E+00	1.00E+00	-5.57E+48	2	4.00E+00	5.46E+01	5.57E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	9.99E-01
9	22.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	4.50E+00	9.00E+01	5.57E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	3.30E+00	1	-3.30E+00	-1	9.98E-01
10	25	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.00E+00	1.48E+02	5.57E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	0.99999	-3.13E+00	-0.99999	9.97E-01
11	27.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.50E+00	2.45E+02	5.57E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	2.98E+00	0.99998	-2.98E+00	-0.99998	9.96E-01
12	30	0.13	0.00E+00	1.00E+00	-5.57E+48	2	6.00E+00	4.03E+02	5.57E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	2.86E+00	0.99995	-2.86E+00	-0.99995	9.94E-01
13	32.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	6.50E+00	6.65E+02	5.57E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	2.75E+00	0.9999	-2.75E+00	-0.9999	9.91E-01
14	35	0.13	0.00E+00	1.00E+00	-5.57E+48	2	7.00E+00	1.10E+03	5.57E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	2.65E+00	0.99982	-2.65E+00	-0.99982	9.89E-01
15	37.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	7.50E+00	1.81E+03	5.57E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	2.56E+00	0.9997	-2.56E+00	-0.9997	9.85E-01
16	40	0.13	0.00E+00	1.00E+00	-5.57E+48	2	8.00E+00	2.98E+03	5.57E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	2.47E+00	0.99953	-2.47E+00	-0.99953	9.82E-01
17	42.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	8.50E+00	4.91E+03	5.57E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	2.40E+00	0.99931	-2.40E+00	-0.99931	9.78E-01
18	45	0.13	0.00E+00	1.00E+00	-5.57E+48	2	9.00E+00	8.10E+03	5.57E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	2.33E+00	0.99903	-2.33E+00	-0.99903	9.74E-01
19	47.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	9.50E+00	1.34E+04	5.57E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	2.27E+00	0.99868	-2.27E+00	-0.99868	9.69E-01
20	50	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.00E+01	2.20E+04	5.57E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	2.21E+00	0.99825	-2.21E+00	-0.99825	9.64E-01



Calc	Value	
v	0.6195	m/d
Rc	1.0000	
u	0.6195	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) -USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Relative Concentration
1	2.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.00E-01	1.65E+00	5.57E+48	0	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	1.00E+00
2	5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.00E+00	2.72E+00	5.57E+48	0	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	1.00E+00
3	7.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.50E+00	4.48E+00	5.57E+48	0	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.00E+00
4	10	0.13	0.00E+00	1.00E+00	-5.57E+48	2	2.00E+00	7.39E+00	5.57E+48	0	3.35E+00	0.999998	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	1.00E+00
5	12.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	2.50E+00	1.22E+01	5.57E+48	0	3.00E+00	0.999978	-3.00E+00	-0.99998	8.85E+00	1	-8.85E+00	-1	1.00E+00
6	15	0.13	0.00E+00	1.00E+00	-5.57E+48	2	3.00E+00	2.01E+01	5.57E+48	0	2.74E+00	0.999892	-2.74E+00	-0.99989	8.08E+00	1	-8.08E+00	-1	1.00E+00
7	17.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	3.50E+00	3.31E+01	5.57E+48	0	2.54E+00	0.999664	-2.54E+00	-0.99966	7.48E+00	1	-7.48E+00	-1	1.00E+00
8	20	0.13	0.00E+00	1.00E+00	-5.57E+48	2	4.00E+00	5.46E+01	5.57E+48	0	2.37E+00	0.999204	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	9.99E-01
9	22.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	4.50E+00	9.00E+01	5.57E+48	0	2.24E+00	0.998435	-2.24E+00	-0.99843	6.60E+00	1	-6.60E+00	-1	9.98E-01
10	25	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.00E+00	1.48E+02	5.57E+48	0	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	9.97E-01
11	27.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	5.50E+00	2.45E+02	5.57E+48	0	2.02E+00	0.995769	-2.02E+00	-0.99577	5.97E+00	1	-5.97E+00	-1	9.96E-01
12	30	0.13	0.00E+00	1.00E+00	-5.57E+48	2	6.00E+00	4.03E+02	5.57E+48	0	1.94E+00	0.99383	-1.94E+00	-0.99383	5.72E+00	1	-5.72E+00	-1	9.94E-01
13	32.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	6.50E+00	6.65E+02	5.57E+48	0	1.86E+00	0.991491	-1.86E+00	-0.99149	5.49E+00	1	-5.49E+00	-1	9.91E-01
14	35	0.13	0.00E+00	1.00E+00	-5.57E+48	2	7.00E+00	1.10E+03	5.57E+48	0	1.79E+00	0.98877	-1.79E+00	-0.98877	5.29E+00	1	-5.29E+00	-1	9.89E-01
15	37.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	7.50E+00	1.81E+03	5.57E+48	0	1.73E+00	0.985694	-1.73E+00	-0.98569	5.11E+00	1	-5.11E+00	-1	9.86E-01
16	40	0.13	0.00E+00	1.00E+00	-5.57E+48	2	8.00E+00	2.98E+03	5.57E+48	0	1.68E+00	0.982294	-1.68E+00	-0.98229	4.95E+00	1	-4.95E+00	-1	9.82E-01
17	42.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	8.50E+00	4.91E+03	5.57E+48	0	1.63E+00	0.978602	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	9.79E-01
18	45	0.13	0.00E+00	1.00E+00	-5.57E+48	2	9.00E+00	8.10E+03	5.57E+48	0	1.58E+00	0.974653	-1.58E+00	-0.97465	4.67E+00	1	-4.67E+00	-1	9.75E-01
19	47.5	0.13	0.00E+00	1.00E+00	-5.57E+48	2	9.50E+00	1.34E+04	5.57E+48	0	1.54E+00	0.970477	-1.54E+00	-0.97048	4.54E+00	1	-4.54E+00	-1	9.70E-01
20	50	0.13	0.00E+00	1.00E+00	-5.57E+48	2	1.00E+01	2.20E+04	5.57E+48	0	1.50E+00	0.966105	-1.50E+00	-0.96611	4.43E+00	1	-4.43E+00	-1	9.66E-01



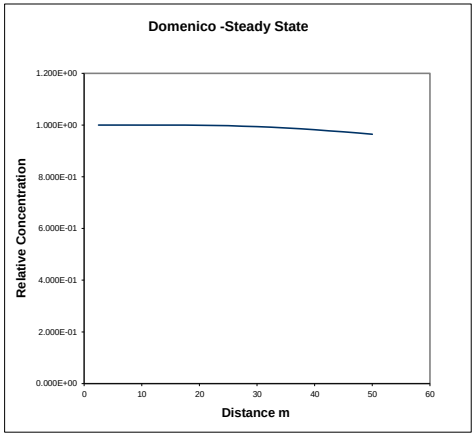
Date:	13.07.2021
Version:	1

Contaminant	Toluene	
Input	**Value**	**Units**
C_T	7.400E-02	mg/l
DF	3.077E+00	
λ	6.931E-101	$days^{-1}$
Sz	3.000E+01	m
Sy	1.400E+01	m
Kd	0.000E+00	l/kg
ρ	2.350E+00	g/cm3
n	1.100E-01	
i	5.925E-02	
K	1.150E+00	m/d
x	5.000E+01	m
z	0.000E+00	m
y	0.000E+00	m
ax	5.000E+00	m
az	5.000E-01	m
ay	5.000E-02	m

DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	0.00E+00	1.00E+00	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	1.000E+00
2	5	0.25	0.00E+00	1.00E+00	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	1.000E+00
3	7.5	0.25	0.00E+00	1.00E+00	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.000E+00
4	10	0.25	0.00E+00	1.00E+00	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	1.000E+00
5	12.5	0.25	0.00E+00	1.00E+00	3.00E+00	0.99998	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	1.000E+00
6	15	0.25	0.00E+00	1.00E+00	2.74E+00	0.99989	-2.74E+00	-0.9999	4.04E+00	1	-4.04E+00	-1	9.999E-01
7	17.5	0.25	0.00E+00	1.00E+00	2.54E+00	0.99966	-2.54E+00	-0.9997	3.74E+00	1	-3.74E+00	-1	9.997E-01
8	20	0.25	0.00E+00	1.00E+00	2.37E+00	0.9992	-2.37E+00	-0.9992	3.50E+00	1	-3.50E+00	-1	9.992E-01
9	22.5	0.25	0.00E+00	1.00E+00	2.24E+00	0.99843	-2.24E+00	-0.9984	3.30E+00	1	-3.30E+00	-1	9.984E-01
10	25	0.25	0.00E+00	1.00E+00	2.12E+00	0.9973	-2.12E+00	-0.9973	3.13E+00	1	-3.13E+00	-1	9.973E-01
11	27.5	0.25	0.00E+00	1.00E+00	2.02E+00	0.99577	-2.02E+00	-0.9958	2.98E+00	1	-2.98E+00	-1	9.957E-01
12	30	0.25	0.00E+00	1.00E+00	1.94E+00	0.99383	-1.94E+00	-0.9938	2.86E+00	1	-2.86E+00	-0.9999	9.938E-01
13	32.5	0.25	0.00E+00	1.00E+00	1.86E+00	0.99149	-1.86E+00	-0.9915	2.75E+00	1	-2.75E+00	-0.9999	9.914E-01
14	35	0.25	0.00E+00	1.00E+00	1.79E+00	0.98877	-1.79E+00	-0.9888	2.65E+00	1	-2.65E+00	-0.9998	9.886E-01
15	37.5	0.25	0.00E+00	1.00E+00	1.73E+00	0.98569	-1.73E+00	-0.9857	2.56E+00	1	-2.56E+00	-0.9997	9.854E-01
16	40	0.25	0.00E+00	1.00E+00	1.68E+00	0.98229	-1.68E+00	-0.9823	2.47E+00	1	-2.47E+00	-0.9995	9.818E-01
17	42.5	0.25	0.00E+00	1.00E+00	1.63E+00	0.9786	-1.63E+00	-0.9786	2.40E+00	0.999	-2.40E+00	-0.9993	9.779E-01
18	45	0.25	0.00E+00	1.00E+00	1.58E+00	0.97465	-1.58E+00	-0.9747	2.33E+00	0.999	-2.33E+00	-0.999	9.737E-01
19	47.5	0.25	0.00E+00	1.00E+00	1.54E+00	0.97048	-1.54E+00	-0.9705	2.27E+00	0.999	-2.27E+00	-0.9987	9.692E-01
20	50	0.25	0.00E+00	1.00E+00	1.50E+00	0.96611	-1.50E+00	-0.9661	2.21E+00	0.998	-2.21E+00	-0.9983	9.644E-01

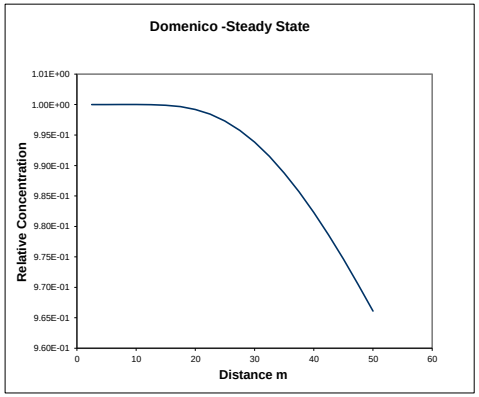


Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Relative Concentration
1	2.5	0.25	0.00E+00	1.00E+00	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	1.00E+00
2	5	0.25	0.00E+00	1.00E+00	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	1.00E+00
3	7.5	0.25	0.00E+00	1.00E+00	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.00E+00
4	10	0.25	0.00E+00	1.00E+00	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	1.00E+00
5	12.5	0.25	0.00E+00	1.00E+00	3.00E+00	0.99998	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	1.00E+00
6	15	0.25	0.00E+00	1.00E+00	2.74E+00	0.99989	-2.74E+00	-0.9999	8.08E+00	1	-8.08E+00	-1	1.00E+00
7	17.5	0.25	0.00E+00	1.00E+00	2.54E+00	0.99966	-2.54E+00	-0.9997	7.48E+00	1	-7.48E+00	-1	1.00E+00
8	20	0.25	0.00E+00	1.00E+00	2.37E+00	0.9992	-2.37E+00	-0.9992	7.00E+00	1	-7.00E+00	-1	9.99E-01
9	22.5	0.25	0.00E+00	1.00E+00	2.24E+00	0.99843	-2.24E+00	-0.9984	6.60E+00	1	-6.60E+00	-1	9.98E-01
10	25	0.25	0.00E+00	1.00E+00	2.12E+00	0.9973	-2.12E+00	-0.9973	6.26E+00	1	-6.26E+00	-1	9.97E-01
11	27.5	0.25	0.00E+00	1.00E+00	2.02E+00	0.99577	-2.02E+00	-0.9958	5.97E+00	1	-5.97E+00	-1	9.96E-01
12	30	0.25	0.00E+00	1.00E+00	1.94E+00	0.99383	-1.94E+00	-0.9938	5.72E+00	1	-5.72E+00	-1	9.94E-01
13	32.5	0.25	0.00E+00	1.00E+00	1.86E+00	0.99149	-1.86E+00	-0.9915	5.49E+00	1	-5.49E+00	-1	9.91E-01
14	35	0.25	0.00E+00	1.00E+00	1.79E+00	0.98877	-1.79E+00	-0.9888	5.29E+00	1	-5.29E+00	-1	9.89E-01
15	37.5	0.25	0.00E+00	1.00E+00	1.73E+00	0.98569	-1.73E+00	-0.9857	5.11E+00	1	-5.11E+00	-1	9.86E-01
16	40	0.25	0.00E+00	1.00E+00	1.68E+00	0.98229	-1.68E+00	-0.9823	4.95E+00	1	-4.95E+00	-1	9.82E-01
17	42.5	0.25	0.00E+00	1.00E+00	1.63E+00	0.9786	-1.63E+00	-0.9786	4.80E+00	1	-4.80E+00	-1	9.79E-01
18	45	0.25	0.00E+00	1.00E+00	1.58E+00	0.97465	-1.58E+00	-0.9747	4.67E+00	1	-4.67E+00	-1	9.75E-01
19	47.5	0.25	0.00E+00	1.00E+00	1.54E+00	0.97048	-1.54E+00	-0.9705	4.54E+00	1	-4.54E+00	-1	9.70E-01
20	50	0.25	0.00E+00	1.00E+00	1.50E+00	0.96611	-1.50E+00	-0.9661	4.43E+00	1	-4.43E+00	-1	9.66E-01



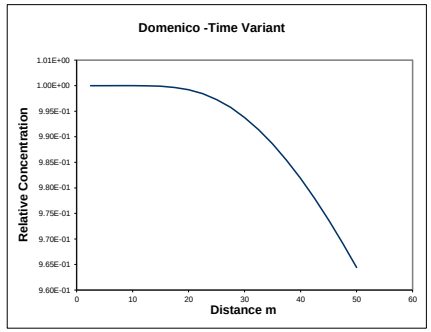
Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

Contaminant	Tolune		
Input	**Value**	**Units**	
C_T	0.074	mg/l	
DF	3.0774		
λ	6.931E-101	$days^{-1}$	
Sz	3.000E+01	m	
Sy	1.400E+01	m	
Kd	0.000E+00	l/kg	
ρ	2.350E+00	g/cm3	
n	1.100E-01		
i	5.925E-02		
K	1.150E+00	m/d	
x	5.000E+01	m	
z	0.000E+00	m	
y	0.000E+00	m	
t	1.000E+99	days	
ax	5.000E+00	m	
az	5.000E-01	m	
ay	5.000E-02	m	

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

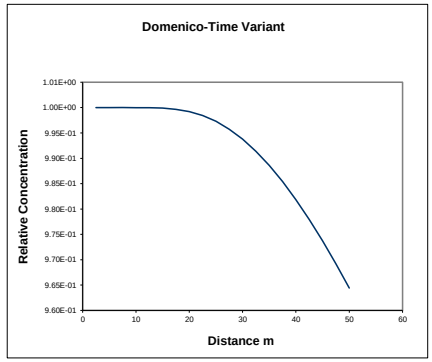
	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	6.71E+00	1	-6.71E+00	-1	9.90E+00	1	-9.90E+00	-1	1.00E+00
2	5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	4.74E+00	1	-4.74E+00	-1	7.00E+00	1	-7.00E+00	-1	1.00E+00
3	7.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.87E+00	1	-3.87E+00	-1	5.72E+00	1	-5.72E+00	-1	1.00E+00
4	10	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.35E+00	1	-3.35E+00	-1	4.95E+00	1	-4.95E+00	-1	1.00E+00
5	12.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.00E+00	1	-3.00E+00	-1	4.43E+00	1	-4.43E+00	-1	1.00E+00
6	15	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.74E+00	0.9999	-2.74E+00	-1	4.04E+00	1	-4.04E+00	-1	1.00E+00
7	17.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.54E+00	0.9997	-2.54E+00	-1	3.74E+00	1	-3.74E+00	-1	1.00E+00
8	20	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	3.50E+00	1	-3.50E+00	-1	9.99E-01
9	22.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	3.30E+00	1	-3.30E+00	-1	9.98E-01
10	25	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	3.13E+00	1	-3.13E+00	-1	9.97E-01
11	27.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.98E+00	1	-2.98E+00	-1	9.96E-01
12	30	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.86E+00	0.9999	-2.86E+00	-1	9.94E-01
13	32.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	2.75E+00	0.9999	-2.75E+00	-1	9.91E-01
14	35	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	2.65E+00	0.9998	-2.65E+00	-1	9.89E-01
15	37.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	2.56E+00	0.9997	-2.56E+00	-1	9.85E-01
16	40	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	2.47E+00	0.9995	-2.47E+00	-1	9.82E-01
17	42.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	2.40E+00	0.9993	-2.40E+00	-0.999	9.78E-01
18	45	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	2.33E+00	0.999	-2.33E+00	-0.999	9.74E-01
19	47.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	2.27E+00	0.9987	-2.27E+00	-0.999	9.69E-01
20	50	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	2.21E+00	0.9983	-2.21E+00	-0.998	9.64E-01



Calc	Value	
v	6.19E-01	m/d
Rc	1.00E+00	
u	6.19E-01	m/d

Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Relative Concentration
	m														
1	2.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	6.71E+00	1	-6.71E+00	-1	1.98E+01	1	-1.98E+01	-1	1.00E+00
2	5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	4.74E+00	1	-4.74E+00	-1	1.40E+01	1	-1.40E+01	-1	1.00E+00
3	7.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.87E+00	1	-3.87E+00	-1	1.14E+01	1	-1.14E+01	-1	1.00E+00
4	10	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.35E+00	1	-3.35E+00	-1	9.90E+00	1	-9.90E+00	-1	1.00E+00
5	12.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	3.00E+00	1	-3.00E+00	-1	8.85E+00	1	-8.85E+00	-1	1.00E+00
6	15	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.74E+00	0.9999	-2.74E+00	-1	8.08E+00	1	-8.08E+00	-1	1.00E+00
7	17.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.54E+00	0.9997	-2.54E+00	-1	7.48E+00	1	-7.48E+00	-1	1.00E+00
8	20	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	7.00E+00	1	-7.00E+00	-1	9.99E-01
9	22.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	6.60E+00	1	-6.60E+00	-1	9.98E-01
10	25	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	6.26E+00	1	-6.26E+00	-1	9.97E-01
11	27.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	5.97E+00	1	-5.97E+00	-1	9.96E-01
12	30	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	5.72E+00	1	-5.72E+00	-1	9.94E-01
13	32.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	5.49E+00	1	-5.49E+00	-1	9.91E-01
14	35	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	5.29E+00	1	-5.29E+00	-1	9.89E-01
15	37.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	5.11E+00	1	-5.11E+00	-1	9.86E-01
16	40	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	4.95E+00	1	-4.95E+00	-1	9.82E-01
17	42.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	4.80E+00	1	-4.80E+00	-1	9.79E-01
18	45	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	4.67E+00	1	-4.67E+00	-1	9.75E-01
19	47.5	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	4.54E+00	1	-4.54E+00	-1	9.70E-01
20	50	0.125	0.00E+00	1.00E+00	-5.57E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	4.43E+00	1	-4.43E+00	-1	9.66E-01



Date:	13.07.2021
Version:	1

OGATA BANKS SOLUTION

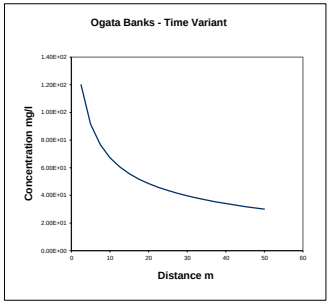
Contaminant	Toluene	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.85E-102	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

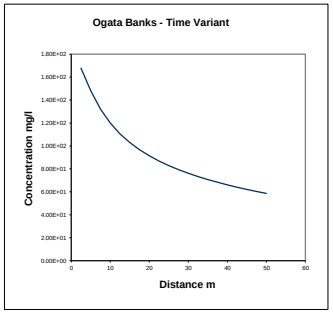
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.0E-01	1.6E+00	2.2E+48	0.000	6.7E+00	1	-6.7E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.20E+02
2	5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.0E+00	2.7E+00	2.2E+48	0.000	4.7E+00	1	-4.7E+00	-1	5.0E-01	0.5205	-5.0E-01	-0.5205	9.15E+01
3	7.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.5E+00	4.5E+00	2.2E+48	0.000	3.9E+00	1	-3.9E+00	-1	4.1E-01	0.4363	-4.1E-01	-0.4363	7.67E+01
4	10	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	2.0E+00	7.4E+00	2.2E+48	0.000	3.4E+00	1	-3.4E+00	-1	3.5E-01	0.3829	-3.5E-01	-0.38292	6.73E+01
5	12.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	2.5E+00	1.2E+01	2.2E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	3.2E-01	0.3453	-3.2E-01	-0.34528	6.07E+01
6	15	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	3.0E+00	2.0E+01	2.2E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	2.9E-01	0.3169	-2.9E-01	-0.31691	5.57E+01
7	17.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	3.5E+00	3.3E+01	2.2E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	2.7E-01	0.2945	-2.7E-01	-0.29454	5.18E+01
8	20	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	4.0E+00	5.5E+01	2.2E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	2.5E-01	0.2763	-2.5E-01	-0.27633	4.85E+01
9	22.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	4.5E+00	9.0E+01	2.2E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	2.4E-01	0.2611	-2.4E-01	-0.26112	4.58E+01
10	25	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.0E+00	1.5E+02	2.2E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	2.2E-01	0.2482	-2.2E-01	-0.24817	4.35E+01
11	27.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.5E+00	2.4E+02	2.2E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	2.1E-01	0.237	-2.1E-01	-0.23698	4.15E+01
12	30	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	6.0E+00	4.0E+02	2.2E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	2.0E-01	0.2272	-2.0E-01	-0.22717	3.97E+01
13	32.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	6.5E+00	6.7E+02	2.2E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	2.0E-01	0.2185	-2.0E-01	-0.21849	3.81E+01
14	35	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	7.0E+00	1.1E+03	2.2E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	1.9E-01	0.2107	-1.9E-01	-0.21073	3.66E+01
15	37.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	7.5E+00	1.8E+03	2.2E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	1.8E-01	0.2037	-1.8E-01	-0.20375	3.53E+01
16	40	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	8.0E+00	3.0E+03	2.2E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	1.8E-01	0.1974	-1.8E-01	-0.19741	3.41E+01
17	42.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	8.5E+00	4.9E+03	2.2E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	1.7E-01	0.1916	-1.7E-01	-0.19163	3.30E+01
18	45	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	9.0E+00	8.1E+03	2.2E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	1.7E-01	0.1863	-1.7E-01	-0.18634	3.19E+01
19	47.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	9.5E+00	1.3E+04	2.2E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	1.6E-01	0.1815	-1.6E-01	-0.18145	3.10E+01
20	50	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.0E+01	2.2E+04	2.2E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	1.6E-01	0.1769	-1.6E-01	-0.17694	3.01E+01



Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4	EXP	Term 5	ERFC	Term 6a	ERF	Term 6b	ERF	Term 7a	ERF	Term 7b	ERF	Concentration
1	2.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.0E-01	1.6E+00	2.2E+48	0.000	6.7E+00	1	-6.7E+00	-1	1.4E+00	0.9545	-1.4E+00	-0.9545	1.68E+02
2	5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.0E+00	2.7E+00	2.2E+48	0.000	4.7E+00	1	-4.7E+00	-1	1.0E+00	0.8427	-1.0E+00	-0.8427	1.48E+02
3	7.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.5E+00	4.5E+00	2.2E+48	0.000	3.9E+00	1	-3.9E+00	-1	8.2E-01	0.7518	-8.2E-01	-0.75179	1.32E+02
4	10	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	2.0E+00	7.4E+00	2.2E+48	0.000	3.4E+00	1	-3.4E+00	-1	7.1E-01	0.6827	-7.1E-01	-0.68269	1.20E+02
5	12.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	2.5E+00	1.2E+01	2.2E+48	0.000	3.0E+00	1	-3.0E+00	-0.99998	6.3E-01	0.6289	-6.3E-01	-0.62891	1.11E+02
6	15	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	3.0E+00	2.0E+01	2.2E+48	0.000	2.7E+00	0.9999	-2.7E+00	-0.99989	5.8E-01	0.5858	-5.8E-01	-0.58578	1.03E+02
7	17.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	3.5E+00	3.3E+01	2.2E+48	0.000	2.5E+00	0.9997	-2.5E+00	-0.99966	5.3E-01	0.5503	-5.3E-01	-0.55031	9.67E+01
8	20	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	4.0E+00	5.5E+01	2.2E+48	0.000	2.4E+00	0.9992	-2.4E+00	-0.9992	5.0E-01	0.5205	-5.0E-01	-0.5205	9.14E+01
9	22.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	4.5E+00	9.0E+01	2.2E+48	0.000	2.2E+00	0.9984	-2.2E+00	-0.99843	4.7E-01	0.495	-4.7E-01	-0.49501	8.69E+01
10	25	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.0E+00	1.5E+02	2.2E+48	0.000	2.1E+00	0.9973	-2.1E+00	-0.9973	4.5E-01	0.4729	-4.5E-01	-0.47291	8.29E+01
11	27.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	5.5E+00	2.4E+02	2.2E+48	0.000	2.0E+00	0.9958	-2.0E+00	-0.99577	4.3E-01	0.4535	-4.3E-01	-0.45351	7.94E+01
12	30	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	6.0E+00	4.0E+02	2.2E+48	0.000	1.9E+00	0.9938	-1.9E+00	-0.99383	4.1E-01	0.4363	-4.1E-01	-0.4363	7.62E+01
13	32.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	6.5E+00	6.7E+02	2.2E+48	0.000	1.9E+00	0.9915	-1.9E+00	-0.99149	3.9E-01	0.4209	-3.9E-01	-0.4209	7.34E+01
14	35	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	7.0E+00	1.1E+03	2.2E+48	0.000	1.8E+00	0.9888	-1.8E+00	-0.98877	3.8E-01	0.407	-3.8E-01	-0.40702	7.08E+01
15	37.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	7.5E+00	1.8E+03	2.2E+48	0.000	1.7E+00	0.9857	-1.7E+00	-0.98569	3.7E-01	0.3944	-3.7E-01	-0.39442	6.83E+01
16	40	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	8.0E+00	3.0E+03	2.2E+48	0.000	1.7E+00	0.9823	-1.7E+00	-0.98229	3.5E-01	0.3829	-3.5E-01	-0.38292	6.61E+01
17	42.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	8.5E+00	4.9E+03	2.2E+48	0.000	1.6E+00	0.9786	-1.6E+00	-0.9786	3.4E-01	0.3724	-3.4E-01	-0.37237	6.41E+01
18	45	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	9.0E+00	8.1E+03	2.2E+48	0.000	1.6E+00	0.9747	-1.6E+00	-0.97465	3.3E-01	0.3626	-3.3E-01	-0.36265	6.21E+01
19	47.5	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	9.5E+00	1.3E+04	2.2E+48	0.000	1.5E+00	0.9705	-1.5E+00	-0.97048	3.2E-01	0.3536	-3.2E-01	-0.35364	6.03E+01
20	50	21.975	0.0E+00	1.0E+00	-2.2E+48	2.000	1.0E+01	2.2E+04	2.2E+48	0.000	1.5E+00	0.9661	-1.5E+00	-0.96611	3.2E-01	0.3453	-3.2E-01	-0.34528	5.86E+01



Date:	13.07.2021
Version:	1

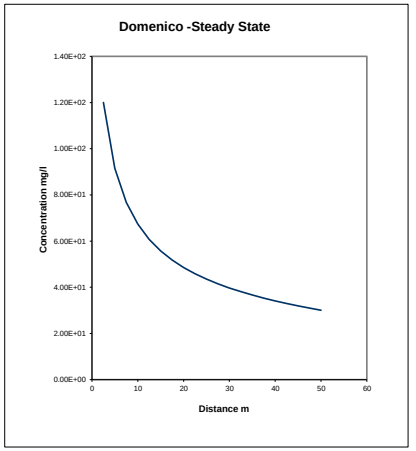
DOMENICO (STEADY STATE)

Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.85E-102	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion optio Simulate vertical dispersion in 1 direction

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	0.00E+00	1.00E+00	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.20E+02
2	5	43.95	0.00E+00	1.00E+00	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.52	-5.00E-01	-0.5205	9.15E+01
3	7.5	43.95	0.00E+00	1.00E+00	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.436	-4.08E-01	-0.4363	7.67E+01
4	10	43.95	0.00E+00	1.00E+00	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.383	-3.54E-01	-0.3829	6.73E+01
5	12.5	43.95	0.00E+00	1.00E+00	3.00E+00	0.99998	-3.00E+00	-1	3.16E-01	0.345	-3.16E-01	-0.3453	6.07E+01
6	15	43.95	0.00E+00	1.00E+00	2.74E+00	0.99989	-2.74E+00	-0.9999	2.89E-01	0.317	-2.89E-01	-0.3169	5.57E+01
7	17.5	43.95	0.00E+00	1.00E+00	2.54E+00	0.99966	-2.54E+00	-0.9997	2.67E-01	0.295	-2.67E-01	-0.2945	5.18E+01
8	20	43.95	0.00E+00	1.00E+00	2.37E+00	0.9992	-2.37E+00	-0.9992	2.50E-01	0.276	-2.50E-01	-0.2763	4.85E+01
9	22.5	43.95	0.00E+00	1.00E+00	2.24E+00	0.99843	-2.24E+00	-0.9984	2.36E-01	0.261	-2.36E-01	-0.2611	4.58E+01
10	25	43.95	0.00E+00	1.00E+00	2.12E+00	0.9973	-2.12E+00	-0.9973	2.24E-01	0.248	-2.24E-01	-0.2482	4.35E+01
11	27.5	43.95	0.00E+00	1.00E+00	2.02E+00	0.99577	-2.02E+00	-0.9958	2.13E-01	0.237	-2.13E-01	-0.237	4.15E+01
12	30	43.95	0.00E+00	1.00E+00	1.94E+00	0.99383	-1.94E+00	-0.9938	2.04E-01	0.227	-2.04E-01	-0.2272	3.97E+01
13	32.5	43.95	0.00E+00	1.00E+00	1.86E+00	0.99149	-1.86E+00	-0.9915	1.96E-01	0.218	-1.96E-01	-0.2185	3.81E+01
14	35	43.95	0.00E+00	1.00E+00	1.79E+00	0.98877	-1.79E+00	-0.9888	1.89E-01	0.211	-1.89E-01	-0.2107	3.66E+01
15	37.5	43.95	0.00E+00	1.00E+00	1.73E+00	0.98569	-1.73E+00	-0.9857	1.83E-01	0.204	-1.83E-01	-0.2037	3.53E+01
16	40	43.95	0.00E+00	1.00E+00	1.68E+00	0.98229	-1.68E+00	-0.9823	1.77E-01	0.197	-1.77E-01	-0.1974	3.41E+01
17	42.5	43.95	0.00E+00	1.00E+00	1.63E+00	0.9786	-1.63E+00	-0.9786	1.71E-01	0.192	-1.71E-01	-0.1916	3.30E+01
18	45	43.95	0.00E+00	1.00E+00	1.58E+00	0.97465	-1.58E+00	-0.9747	1.67E-01	0.186	-1.67E-01	-0.1863	3.19E+01
19	47.5	43.95	0.00E+00	1.00E+00	1.54E+00	0.97048	-1.54E+00	-0.9705	1.62E-01	0.181	-1.62E-01	-0.1815	3.10E+01
20	50	43.95	0.00E+00	1.00E+00	1.50E+00	0.96611	-1.50E+00	-0.9661	1.58E-01	0.177	-1.58E-01	-0.1769	3.01E+01

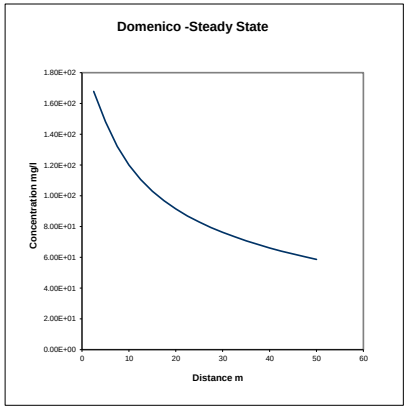


DOMENICO (STEADY STATE)

Calculations for source located at top of aquifer (ie vertical dispersion in one direction) - USED FOR LEVEL ASSESSMENT

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

	X	Term 1	Term 2	EXP	Term 3A	ERF	Term 3B	ERF	Term 4A	ERF	Term 4B	ERF	Concentration
1	2.5	43.95	0.00E+00	1.00E+00	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.954	-1.41E+00	-0.9545	1.68E+02
2	5	43.95	0.00E+00	1.00E+00	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.843	-1.00E+00	-0.8427	1.48E+02
3	7.5	43.95	0.00E+00	1.00E+00	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.752	-8.16E-01	-0.7518	1.32E+02
4	10	43.95	0.00E+00	1.00E+00	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.683	-7.07E-01	-0.6827	1.20E+02
5	12.5	43.95	0.00E+00	1.00E+00	3.00E+00	0.99998	-3.00E+00	-1	6.32E-01	0.629	-6.32E-01	-0.6289	1.11E+02
6	15	43.95	0.00E+00	1.00E+00	2.74E+00	0.99989	-2.74E+00	-0.9999	5.77E-01	0.586	-5.77E-01	-0.5858	1.03E+02
7	17.5	43.95	0.00E+00	1.00E+00	2.54E+00	0.99966	-2.54E+00	-0.9997	5.35E-01	0.55	-5.35E-01	-0.5503	9.67E+01
8	20	43.95	0.00E+00	1.00E+00	2.37E+00	0.9992	-2.37E+00	-0.9992	5.00E-01	0.52	-5.00E-01	-0.5205	9.14E+01
9	22.5	43.95	0.00E+00	1.00E+00	2.24E+00	0.99843	-2.24E+00	-0.9984	4.71E-01	0.495	-4.71E-01	-0.495	8.69E+01
10	25	43.95	0.00E+00	1.00E+00	2.12E+00	0.9973	-2.12E+00	-0.9973	4.47E-01	0.473	-4.47E-01	-0.4729	8.29E+01
11	27.5	43.95	0.00E+00	1.00E+00	2.02E+00	0.99577	-2.02E+00	-0.9958	4.26E-01	0.454	-4.26E-01	-0.4535	7.94E+01
12	30	43.95	0.00E+00	1.00E+00	1.94E+00	0.99383	-1.94E+00	-0.9938	4.08E-01	0.436	-4.08E-01	-0.4363	7.62E+01
13	32.5	43.95	0.00E+00	1.00E+00	1.86E+00	0.99149	-1.86E+00	-0.9915	3.92E-01	0.421	-3.92E-01	-0.4209	7.34E+01
14	35	43.95	0.00E+00	1.00E+00	1.79E+00	0.98877	-1.79E+00	-0.9888	3.78E-01	0.407	-3.78E-01	-0.407	7.08E+01
15	37.5	43.95	0.00E+00	1.00E+00	1.73E+00	0.98569	-1.73E+00	-0.9857	3.65E-01	0.394	-3.65E-01	-0.3944	6.83E+01
16	40	43.95	0.00E+00	1.00E+00	1.68E+00	0.98229	-1.68E+00	-0.9823	3.54E-01	0.383	-3.54E-01	-0.3829	6.61E+01
17	42.5	43.95	0.00E+00	1.00E+00	1.63E+00	0.9786	-1.63E+00	-0.9786	3.43E-01	0.372	-3.43E-01	-0.3724	6.41E+01
18	45	43.95	0.00E+00	1.00E+00	1.58E+00	0.97465	-1.58E+00	-0.9747	3.33E-01	0.363	-3.33E-01	-0.3626	6.21E+01
19	47.5	43.95	0.00E+00	1.00E+00	1.54E+00	0.97048	-1.54E+00	-0.9705	3.24E-01	0.354	-3.24E-01	-0.3536	6.03E+01
20	50	43.95	0.00E+00	1.00E+00	1.50E+00	0.96611	-1.50E+00	-0.9661	3.16E-01	0.345	-3.16E-01	-0.3453	5.86E+01



Date:	13.07.2021
Version:	1

DOMENICO (TIME VARIANT)

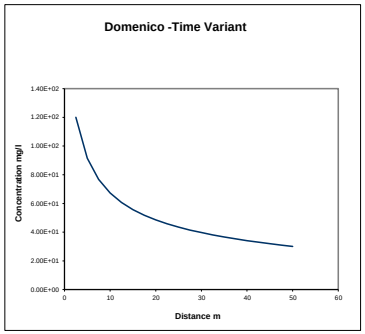
Contaminant	Tolune	
Input	**Value**	**Units**
C_T	0.074	mg/l
Co	1.76E+02	mg/l
λ	1.85E-102	days^{-1}
Sz	3.00E+01	m
Sy	1.00E+00	m
Kd	1.90E+00	l/kg
ρ	2.35E+00	g/cm3
n	1.10E-01	
i	4.00E-02	
K	1.15E+00	m/d
x	5.00E+01	m
z	0.00E+00	m
y	0.00E+00	m
t	1.00E+100	days
ax	5.00E+00	m
az	5.00E-01	m
ay	5.00E-02	m

Vertical dispersion option: Simulate vertical dispersion in 1 direction

Calc	Value	
v	4.18E-01	m/d
Rc	4.15E+01	
u	1.01E-02	m/d

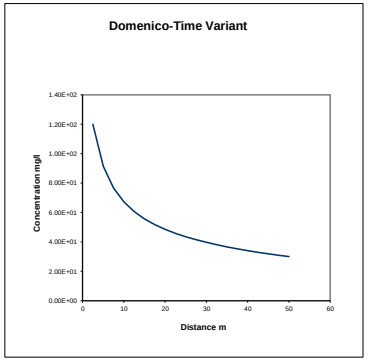
Calculations for source located in centre of aquifer (ie vertical dispersion in two directions)

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	6.71E+00	1	-6.71E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.20E+02
2	5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	4.74E+00	1	-4.74E+00	-1	5.00E-01	0.5205	-5.00E-01	-0.52	9.15E+01
3	7.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.87E+00	1	-3.87E+00	-1	4.08E-01	0.4363	-4.08E-01	-0.436	7.67E+01
4	10	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.35E+00	1	-3.35E+00	-1	3.54E-01	0.3829	-3.54E-01	-0.383	6.73E+01
5	12.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.00E+00	1	-3.00E+00	-1	3.16E-01	0.3453	-3.16E-01	-0.345	6.07E+01
6	15	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.74E+00	0.9999	-2.74E+00	-1	2.89E-01	0.3169	-2.89E-01	-0.317	5.57E+01
7	17.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.54E+00	0.9997	-2.54E+00	-1	2.67E-01	0.2945	-2.67E-01	-0.295	5.18E+01
8	20	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	2.50E-01	0.2763	-2.50E-01	-0.276	4.85E+01
9	22.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	2.36E-01	0.2611	-2.36E-01	-0.261	4.58E+01
10	25	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	2.24E-01	0.2482	-2.24E-01	-0.248	4.35E+01
11	27.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	2.13E-01	0.237	-2.13E-01	-0.237	4.15E+01
12	30	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	2.04E-01	0.2272	-2.04E-01	-0.227	3.97E+01
13	32.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	1.96E-01	0.2185	-1.96E-01	-0.218	3.81E+01
14	35	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	1.89E-01	0.2107	-1.89E-01	-0.211	3.66E+01
15	37.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	1.83E-01	0.2037	-1.83E-01	-0.204	3.53E+01
16	40	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	1.77E-01	0.1974	-1.77E-01	-0.197	3.41E+01
17	42.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	1.71E-01	0.1916	-1.71E-01	-0.192	3.30E+01
18	45	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	1.67E-01	0.1863	-1.67E-01	-0.186	3.19E+01
19	47.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	1.62E-01	0.1815	-1.62E-01	-0.181	3.10E+01
20	50	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	1.58E-01	0.1769	-1.58E-01	-0.177	3.01E+01



Calculations for source located at top of aquifer (ie vertical dispersion in one direction only) - USED FOR LEVEL ASSESSMENT

	X	Term 1	Term 2	EXP	Term 3	ERFC	Term 4A	ERF	Term 4B	ERF	Term 5A	ERF	Term 5B	ERF	Concentration
	m														
1	2.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	6.71E+00	1	-6.71E+00	-1	1.41E+00	0.9545	-1.41E+00	-0.954	1.68E+02
2	5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	4.74E+00	1	-4.74E+00	-1	1.00E+00	0.8427	-1.00E+00	-0.843	1.48E+02
3	7.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.87E+00	1	-3.87E+00	-1	8.16E-01	0.7518	-8.16E-01	-0.752	1.32E+02
4	10	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.35E+00	1	-3.35E+00	-1	7.07E-01	0.6827	-7.07E-01	-0.683	1.20E+02
5	12.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	3.00E+00	1	-3.00E+00	-1	6.32E-01	0.6289	-6.32E-01	-0.629	1.11E+02
6	15	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.74E+00	0.9999	-2.74E+00	-1	5.77E-01	0.5858	-5.77E-01	-0.586	1.03E+02
7	17.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.54E+00	0.9997	-2.54E+00	-1	5.35E-01	0.5503	-5.35E-01	-0.55	9.67E+01
8	20	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.37E+00	0.9992	-2.37E+00	-0.999	5.00E-01	0.5205	-5.00E-01	-0.52	9.14E+01
9	22.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.24E+00	0.9984	-2.24E+00	-0.998	4.71E-01	0.495	-4.71E-01	-0.495	8.69E+01
10	25	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.12E+00	0.9973	-2.12E+00	-0.997	4.47E-01	0.4729	-4.47E-01	-0.473	8.29E+01
11	27.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	2.02E+00	0.9958	-2.02E+00	-0.996	4.26E-01	0.4535	-4.26E-01	-0.454	7.94E+01
12	30	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.94E+00	0.9938	-1.94E+00	-0.994	4.08E-01	0.4363	-4.08E-01	-0.436	7.62E+01
13	32.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.86E+00	0.9915	-1.86E+00	-0.991	3.92E-01	0.4209	-3.92E-01	-0.421	7.34E+01
14	35	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.79E+00	0.9888	-1.79E+00	-0.989	3.78E-01	0.407	-3.78E-01	-0.407	7.08E+01
15	37.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.73E+00	0.9857	-1.73E+00	-0.986	3.65E-01	0.3944	-3.65E-01	-0.394	6.83E+01
16	40	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.68E+00	0.9823	-1.68E+00	-0.982	3.54E-01	0.3829	-3.54E-01	-0.383	6.61E+01
17	42.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.63E+00	0.9786	-1.63E+00	-0.979	3.43E-01	0.3724	-3.43E-01	-0.372	6.41E+01
18	45	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.58E+00	0.9747	-1.58E+00	-0.975	3.33E-01	0.3626	-3.33E-01	-0.363	6.21E+01
19	47.5	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.54E+00	0.9705	-1.54E+00	-0.97	3.24E-01	0.3536	-3.24E-01	-0.354	6.03E+01
20	50	21.975	0.00E+00	1.00E+00	-2.24E+48	2	1.50E+00	0.9661	-1.50E+00	-0.966	3.16E-01	0.3453	-3.16E-01	-0.345	5.86E+01



Date:	13.07.2021
Version:	1

APPENDIX C

Comparison RTVs with Site Investigation Data

<Tier 1 Soil	<13.2	<55.4	<84.9	<670	<15000						<0.014	<0.151	<1.34	<2.11	<4.21						<14	<151	<130					<141
Tier 1 Soils	>13.2	>55.4	>84.9	>670	>15000						>0.014	>0.151	>1.34	>2.11	>4.21						>14	>151	>130					>141
Tier 3 Soils	>895	>3760	>5770	>45500	>161000						>0.08	>1220	>91	>144	>45.2						>88	1220000	7400					>9560

					Aliphatics									Aromatics														
Lab ref	Sample	Depth	Date sampled	Natural Moisture Content	>C5-C6 #M	>C6-C8 #M	>C8-C10	>C10-C12 #M	>C12-C16 #M	>C16-C21 #M	>C21-C35 #M	aliphatics C	>C5-EC7 #	>EC7-EC8 #	EC8-EC10 #	EC10-EC12	EC12-EC16	EC16-EC21	EC21-EC35	aromatics C	cs and arom	Tertiary Buty	Benzene #	Toluene #	Ethylbenzene	m/p-Xylene #	o-Xylene #	Total Xylenes
				%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
20/13383	HS10-TP1-S1	0.5	30/09/2020	15.1	*1*	12.9	8.4	10.8	*4*	*7*	23	55	*1*	3.9	9.9	16.3	12	13	*7*	55	110	*2*	*3*	12256	2279	15365	5600	20965.0
20/13383	HS10-TP2-S1	0.50-0.70	30/09/2020	22.8	2.9	278.4	150.3	708.4	328	61	134	1663	*0.1*	291.4	192.6	197.2	84	128	96	989	2652	*2*	*3*	53891	54705	55316	40547	95863.0
20/17261	HS11-TP10-S1	0.40-1.60	07/12/2020	14.7	3.8	368	199.6	15.1	*4*	*7*	*7*	587	*1*	557.3	616.2	10.3	*4*	*7*	*7*	1184	1771	220	114	46811	37679	67836	49345	117181.0
20/16571	HS11-TP1-S1	0.15-0.40	25/11/2020	22.1	9	195.8	233.9	1981.9	68	31	385	2905	*1*	183.9	360.2	410.4	16	28	505	1504	4409	26	37	50491	64551	153308	69244	222552.0
20/16571	HS11-TP1-S2	1.90-2.30	25/11/2020	8.9	0.3	0.1	0.2	*0.2*	*4*	*7*	*7*	*19*	*1*	0.1	0.2	*0.2*	*4*	*7*	*7*	*19*	*38*	22	*3*	3012	708	2990	907	3897.0
20/16571	HS11-TP2-S1	0.25-0.50	25/11/2020	14.4	*0.1*	0.7	3.5	20.9	*4*	*7*	17	42	*1*	1.1	4	21.4	*4*	*7*	*7*	27	69	8	16	6494	8912	22359	7139	29498.0
20/16571	HS11-TP2-S2	1.00-1.50	25/11/2020	7	*0.1*	0.2	0.4	*0.2*	*4*	*7*	*7*	*19*	*1*	0.3	0.7	*0.2*	*4*	*7*	*7*	*19*	*38*	4	*3*	1194	364	1808	434	2242.0
20/16571	HS11-TP3-S1	0.15-0.45	25/11/2020	18.6	*0.1*	7.7	5.3	18.1	13	25	79	148	*1*	0.2	1.9	9.5	*4*	30	60	102	250	*2*	5	102	1042	3766	368	4134.0
20/16571	HS11-TP3-S2	1.00-1.30	25/11/2020	13.1	*0.1*	0.3	0.3	*0.2*	*4*	*7*	*7*	*19*	*1*	*1*	0.5	*0.2*	*4*	*7*	*7*	*19*	*38*	*2*	20	*NA*	304	265	*NA*	#VALUE!
20/16893	HS11-TP4-51	0.15-0.50	01/12/2020	23.7	0.2	8.2	9.6	15.2	*4*	*7*	*7*	33	*0.1*	2	17.2	20.9	*4*	14	67	121	154	9	*5*	5811	5305	22372	4569	26941.0
20/16893	HS11-TP4-52	1.80-2.10	01/12/2020	14.4	1	40.5	28.6	*0.2*	*4*	*7*	*7*	70	0.2	154.3	101.1	7.9	*4*	*7*	*7*	264	334	17	169	24813	9126	23824	8598	32422.0
20/16893	HS11-TP5-51	0.40-0.85	01/12/2020	20.1	*0.1*	0.2	4.6	67.6	*4*	*7*	50	122	*0.1*	1.2	13.7	37.8	16	24	92	185	307	*6*	*7*	2864	2183	19437	5497	24934.0
20/16893	HS11-TP5-52	2.00-2.40	01/12/2020	14	0.1	9.7	17	13.6	*4*	*7*	*7*	40	*0.1*	44.8	54.2	11.1	*4*	*7*	*7*	110	150	*6*	154	30189	20959	39045	17478	56523.0
20/16893	HS11-TP6-51	0.40-0.70	01/12/2020	38.5	*0.1*	0.6	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*0.1*	0.4	*0.1*	*0.2*	*4*	*7*	51	51	51	*6*	*5*	407	42	30	*4*	34.0
20/17261	HS11-TP7-S1	0.20-0.40	07/12/2020	7.3	0.5	53.2	88.4	73.5	*4*	*7*	*7*	216	*0.1*	51.7	274.4	33.3	*4*	*7*	*7*	359	575	*2*	*3*	19919	20436	37603	30589	68192.0
20/17261	HS11-TP8-S1	0.20-0.40	07/12/2020	13	*0.1*	1.6	14.1	21.2	*4*	*7*	*7*	37	*0.1*	1.7	17.4	38.9	32	*7*	*7*	90	127	*2*	14	1845	2915	13979	1200	15179.0
20/17261	HS11-TP8-S2	1.10-1.60	07/12/2020	8.2	0.5	59.8	116	39.1	*4*	*7*	*7*	215	*0.1*	236.5	400	51.7	15	*7*	*7*	703	918	8	96	27442	28404	46957	35427	82384.0
20/17261	HS11-TP9-S1	0.20-0.40	07/12/2020	11	2.9	224.7	147.5	593.7	20	10	*7*	999	0.1	817.2	576.6	320.7	11	*7*	*7*	1726	2725	42	361	30105	34293	48997	39267	88264.0
20/17261	HS11-TP9-S2	1.00-1.50	07/12/2020	8.2	*1*	*1*	*1*	6	*4*	*7*	*7*	*19*	*1*	*1*	1.3	*0.2*	*4*	*7*	*7*	*19*	*38*	51	*3*	869	111	544	166	710.0
20/13383	HS13-TP1-S1	1.2	30/09/2020	22	0.2	5.1	191.9	1964.1	253	113	110	2637	*0.1*	*0.1*	35.9	442.7	89	73	77	718	3355	*2*	46	133	58461	155835	2209	158044.0
20/16571	HS13-TP2-S1	1.20-1.60	25/11/2020	24.1	*0.1*	1.1	25.1	570.9	616	379	386	1978	*1*	3	2	102.4	185	504	925	1721	3699	5	5	8569	402	3546	2471	6017.0
20/16413	HS14-TP1-S1	0.20-1.20	23/11/2020	19	*0.1*	0.1	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*1*	*1*	*1*	*0.2*	*4*	8	38	46	46	*2*	*3*	6	6	36	8	44.0
20/16413	HS14-TP3-S1	0.40-1.60	23/11/2020	40.9	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*1*	*1*	*1*	*0.2*	*4*	*7*	*7*	*19*	*38*	*2*	*3*	*3*	*3*	*5*	*3*	8.0
20/16413	HS14-TP4-S1	1.70-2.40	23/11/2020	33.1	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*1*	*1*	*1*	*0.2*	*4*	9	48	57	57	*2*	*3*	*3*	*3*	*5*	*3*	8.0
20/17261	HS14-TP5-S1	0.30-0.80	07/12/2020	17	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*0.1*	0.1	*0.1*	*0.2*	*4*	*7*	*7*	*19*	*38*	*2*	*3*	228	19	75	18	93.0
20/17261	HS14-TP6-S1	0.20-1.00	07/12/2020	13.7	*0.1*	0.1	0.7	12.4	6	*7*	*7*	19	*0.1*	0.2	0.9	*0.2*	*4*	*7*	*7*	*19*	*38*	*2*	*3*	*3*	*3*	*5*	*3*	8.0
20/17443	HS2 - TP1 -S1	0.20-0.50	09/12/2020	27.8	*0.1*	*0.1*	0.9	11.8	41	72	677	803	*0.1*	*0.1*	0.6	9.1	19	64	615	708	1511	*6*	*5*	116	81	341	86	427.0
20/17443	HS2 - TP2 -S1	0.30-0.70	09/12/2020	46.2	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	114	114	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	*7*	*19*	114	*6*	*5*	*3*	*3*	*4*	*4*	8.0
20/17443	HS2 - TP3 -S1	0.20-0.50	09/12/2020	25.6	*0.1*	0.3	0.6	55.8	94	132	270	553	*0.1*	*0.1*	3.1	54.4	160	215	339	772	1325	*6*	*5*	8	63	25	16	41.0
20/17443	HS4 - TP1 -S1	0.45-1.00	09/12/2020	28.5	*0.1*	*0.1*	*0.1*	23.6	198	509	394	1125	*0.1*	*0.1*	*0.1*	10.4	31	161	181	383	1508	*6*	*5*	*3*	*3*	*4*	*4*	8.0
20/17443	HS5 - TP1 -S1	1.20-2.00	08/12/2020	16.6	*0.1*	*0.1*	0.2	*0.2*	9	13	9	31	*0.1*	*0.1*	0.9	*0.2*	*7*	17	16	41	72	*6*	*5*	*3*	114	12	5	17.0
20/17443	HS5 - TP2 -S1	0.20-0.60	08/12/2020	13.2	0.2	*0.1*	1.7	42	71	62	520	697	*0.1*	*0.1*	4.1	8.7	22	61	369	465	1162	*6*	*5*	29	189	175	44	219.0
20/17443	HS6 - TP1 -S1	0.25-0.60	08/12/2020	14	*0.1*	*0.1*	*0.1*	*0.2*	*4*	*7*	91	91	*0.1*	*0.1*	*0.1*	*0.2*	*4*	10	105	115	206	*6*	*5*	3	8	6	*4*	10.0
20/17443	HS6 - TP3 -S1	0.15-0.30	08/12/2020	12.8	2.1	23.1	2.3	16.9	25	51	191	311	*0.1*	0.2	10.7	182.2	4486	70	176	4925	5236	*6*	12	1008	262	629	298	927.0
20/17443	HS6 - TP4 -S1	0.20-0.50	08/12/2020	10.3	0.2	3.3	88	*0.2*	*4*	20	76	188	*0.1*	*0.1*	573.1	*0.2*	*4*	*7*	*7*	573	761	*6*	*5*	12	204	115	55	170.0
20/17443	HS6 - TP5 -S1	0.15-0.40	08/12/2020	16	0.2	0.2	10.4	57.4	52	22	108	250	*0.1*	*0.1*	66.7	13.8	14	26	115	236	486	*6*	*5*	201	37323	727	229	956.0
20/17443	HS6 - TP6 -S1	0.40-1.60	08/12/2020	14.4	*0.1*	*0.1*	16.8	730.2	349	21	67	1184	*0.1*	*0.1*	0.8	153	57	*7*	*7*	211	1395	*6*	*5*	112	793	1067	723	1790.0
20/17443	HS7 - TP1 -S1	0.20-1.00	08/12/2020	19.6	*0.1*	*0.1*	0.6	19.6	43	59	444	566	*0.1*	*0.1*	0.4	*0.2*	13	48	885	946	1512	*6*	*5*	8	37	23	10	33.0
20/16893	HS9-TP1-51	0.10-0.60	01/12/2020	28.5	*0.1*	0.1	0.3	*0.2*	*4*	10	68	78	*0.1*	*0.1*	*0.1*	*0.2*	8	14	91	113	191	*6*	*5*	589	91	301	51	352.0
20/16893	HS9-TP1-52	2.20-2.50	01/12/2020	16.3	*0.1*	*0.1*	0.1	27.4	6	*7*	*7*	34	*0.1*	*0.1*	*0.1*	10	5	*7*	*7*	*19*	*38*	*6*	*5*	79	8	30	*4*	34.0
20/4457	Q-TT1-S01	0.2	23/03/2020	9.5	*0.1*	0.3	12.6	*0.2*	*4*	*7*	*7*	*19*	*0.1*	*0.1*	0.8	*0.2*	*4*	*7*	*7*	*19*	*38*	*2*	3	3	7	120	28	148.0
20/13273	QTT1-S1	1.70-2.00	28/09/2020	43.8	0.3	8.8	16.7	189.7	101	59	47	423	*0.1*	44.4	67	223.5	58	46	91	530	953	35	151	43686	54594	94576	38305	132881.0
20/13273	QTT1-S2	1.00-1.50	28/09/2020	25.1	*0.1*	*0.1*	3	*0.2*	*4*	*7*	19	22	*0.1*	0.1	*0.1*	1.6	*4*	11	54	67	89	*2*	5	333	9	38	28	66.0
20/4457	Q-TT2-S01	0.2	23/03/2020	12.6	*0.1*	*0.1*	1.7	1853.8	229	24	75	2184	*0.1*	*0.1*	0.3	658	125	*7*	*7*	783	2967	*2*	*3*	25	9	72	29	101.0
20/13273	QTT2-S1	1.00-2.00	28/09/2020	16.7	*0.1*	0.1	0.4	*0.2*	*4*	15	48	64	*0.1*	0.4	0.4	*0.2*	11	57	166	235	299	*2*	6	483	161	362	82	444.0
20/13273	QTT2-S2	1.50-2.00	28/09/2020	21.4	*0.1*	0.1	1	*0.2*	*4*	*7*	78	79	*0.1*	0.1	4.9	*0.2*	18	78	202	303	382	*2*	16	206	1912	5786	562	6348.0

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						Aliphatics								Aromatics									VOCs							
Lab ref	Phase	Sample	Sample Type	Depth	Date sampled	>C5-C6 #M	>C6-C8 #M	>C8-C10	>C10-C12 #M	>C12-C16 #M	>C16-C21 #M	>C21-C35 #M	aliphatics C	>C5-EC7 #	>EC7-EC8 #	EC8-EC10 #	EC10-EC12	EC12-EC16	EC16-EC21	EC21-EC35	l aromatics C5	ics and aron	Tertiary Buty	Benzene #	Toluene #	thylbenzene	m/p-Xylene #	o-Xylene #	Total Xylene
						ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
21/5886	2 North & South	RBH301	Ground Water	8	20.04.21	*10*	*10*	*10*	5	*10*	*10*	660	660	10	10	10	5	*10*	20	10	20	680	0.1	0.5	*5*	*1*	*2*	*1*	*3*
21/5886	2 North & South	RBH302	Ground Water	14	20.04.21	*10*	*10*	*10*	5	*10*	*10*	*10*	*10*	*10*	10	*10*	*5*	*10*	*10*	*10*	*10*	10	0.1	0.5	*5*	*1*	*2*	*1*	*3*
21/5886	2 North & South	RBH304	Ground Water	12	20.04.21	*10*	135	560	215	*10*	*10*	*10*	910	10	10	1236	405	*30*	10	10	1671	2581	*0.1*	0.5	5	*153*	*911*	12	*923*
21/5886	2 North & South	RBH305	Ground Water	8	20.04.21	*10*	66	*10*	5	*10*	*10*	*10*	66	*10*	*10*	*10*	*5*	*10*	*10*	10	*10*	66	0.1	0.5	*5*	*1*	*2*	*1*	*3*
21/5886	2 North & South	RBH303	Ground Water	9	20.04.21	*10*	*10*	*10*	5	*10*	*10*	*10*	*10*	*10*	*10*	*10*	5	*10*	*10*	*10*	*10*	*10*	0.1	0.5	*5*	*1*	*2*	*1*	*3*
21/5886	2 North & South	RBH314	Ground Water	6	20.04.21	83	*10*	*10*	5	*10*	*10*	*10*	83	*10*	*10*	44	*5*	*10*	*10*	*10*	*44*	*127*	5.2	4.4	*5*	*26*	*11*	*1*	*12*
21/5886	2 North & South	RBH315	Ground Water	5	20.04.21	29	*10*	*10*	5	*10*	*10*	*10*	29	*10*	*10*	*10*	*5*	*10*	*10*	*10*	*10*	*r*	7.3	2.1	*5*	*1*	*2*	*1*	*3*
21/5953	2 North & South	RBH 318	Ground Water	3	21.04.21	65	93	267	*5*	*10*	*10*	*10*	425	13	17	734	405	430	50	*10*	*1649*	2074	3.9	15.6	16	*481*	*281*	6	*287*
21/5953	2 North & South	RBH 317	Ground Water	3	21.04.21	75	327	215	*5*	*10*	*10*	*10*	617	15	15	517	218	*10*	*10*	*10*	*765*	1382	19.5	19.7	16	*428*	*193*	3	*196*
21/5953	2 North & South	RBH 316	Ground Water	3	21.04.21	86	206	153	*195*	*10*	*10*	*10*	640	12	46	291	144	*10*	*10*	*10*	*493*	1133	16.7	13.8	38	196	*65*	4	*69*
21/5953	2 North & South	RBH 319	Ground Water	2	21.04.21	740	42835	9183	*5*	*10*	*10*	*10*	52758	*500*	148803	40847	721	*10*	*10*	*10*	*190371*	243129	90.8	513.2	175815	9214	*27429*	6471	*33900*
21/5953	2 North & South	RBH 320	Ground Water	3	21.04.21	1477	45202	10756	*5*	*10*	*10*	*10*	57435	*500*	155780	47547	1172	*10*	*10*	*10*	*204499*	261934	175.5	404.7	175014	9671	29777	7988	*37765*
21/5953	2 North & South	RBH 321	Ground Water	3	21.04.21	1223	17233	3608	481	*10*	*10*	*10*	22545	*500*	57099	14334	414	*10*	*10*	*10*	*71847*	94392	104.1	88.4	*65735*	2765	*9958*	2533	*12491*
21/5953	2 North & South	RBH 324	Ground Water	3.5	21.04.21	185	6879	4438	*5*	*10*	*10*	*10*	11502	*100*	22201	18075	871	*10*	*10*	*10*	*41147*	52649	53.5	101.7	27788	*3707*	*15315*	3087	*18402*
21/5953	2 North & South	RBH 325	Ground Water	4	21.04.21	2271	31754	5250	*5*	*10*	*10*	*10*	39275	*500*	105779	21780	382	*10*	*10*	*10*	*127941*	167216	257.6	234.2	*116714*	*4831*	*17207*	4127	*21334*
21/5953	2 North & South	RBH 326	Ground Water	3.5	21.04.21	*10*	*10*	*10*	*5*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*5*	*10*	*10*	*10*	*10*	*10*	1	*0.5*	*5*	*1*	*2*	*1*	*3*
21/6030	2 North & South	RBH327	Ground Water	3.5	22.04.21	*20*	2272	1339	*5*	*10*	*10*	*10*	3611	*20*	8142	8015	48	*10*	*10*	*10*	*16205*	*19816*	*0.1*	11.2	9249	*1408*	7604	1164	*8768*
21/6030	2 North & South	RBH328	Ground Water	6	22.04.21	*10*	1084	1318	*5*	*10*	*10*	*10*	2402	*10*	3702	7749	31	*10*	*10*	*10*	*11482*	*13884*	*0.1*	7.1	4334	*1414*	5772	910	*6682*
21/6030	2 North & South	RBH329	Ground Water	5	22.04.21	*10*	*10*	*10*	*5*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	5	*10*	*10*	*10*	*10*	*10*	*0.1*	*0.5*	*5*	1	2	*1*	*3*
21/6030	2 North & South	*RBH323*	Ground Water	4	22.04.21	75	*182*	323	*5*	*10*	*10*	*10*	580	*10*	15	1220	67	*10*	*10*	*10*	1302	1882	10.8	11.2	18	*342*	1051	5	*1056*
21/6030	2 North & South	RBH330	Ground Water	6	22.04.21	*10*	*27*	121	*5*	*10*	*10*	*10*	148	*10*	*10*	232	70	*10*	*10*	*10*	302	450	1	3.4	*5*	*162*	27	2	*29*
21/6030	2 North & South	RBH322	Ground Water	3.5	22.04.21	58	*142*	1026	*5*	*10*	*10*	*10*	1226	18	77	3155	502	60	*10*	*10*	3812	5038	5.6	22.4	*88*	*1687*	1490	83	*1573*
					Min	10	10	10	5	10	10	10		10	10	10	5	10	#REF!	10	10				0.1	0.5	5	1	2
					Maz	2271	45202	10756	481	10	10	660		500	155780	47547	1172	430	#REF!	50	10				257.6	513.2	175815	9671	29777

						Aliphatics								Aromatics									VOCs							
Lab ref	Phase	Sample	Sample Type	Depth	Date sampled	>C5-C6 #M	>C6-C8 #M	>C8-C10	>C10-C12 #M	>C12-C16 #M	>C16-C21 #M	>C21-C35 #M	aliphatics C	>C5-EC7 #	>EC7-EC8 #	EC8-EC10 #	EC10-EC12	EC12-EC16	EC16-EC21	EC21-EC35	l aromatics C5	ics and aron	Tertiary Buty	Benzene #	Toluene #	thylbenzene	m/p-Xylene #	o-Xylene #	Total Xylene
						ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
20/7522	Phase 1 GW	WS302	Ground Water	3.5	11.06.2020	10	19	194	5	10	10	10	194	10	10	18	820	10	10	10	1032	0.1	0.5	5	1	6	6	*12*	*18*
20/7522	Phase 1 GW	WS311	Ground Water	3.5	11.06.2020	10	10	354	62723	188110	235790	88250	575246	10	10	17	21925	123980	148260	51890	321328	0.1	0.5	5	2	2	1	*3*	*4*
20/10999	Phase 1 GW	WS310	Ground Water	3.5	17.08.20	10	10	46	304	1180	1600	750	3880	10	10	10	246	870	1120	510	6626	0.3	0.8	5	2	2	1	*3*	*4*
20/10999	Phase 1 GW	WS312	Ground Water	3.5	17.08.20	64	26	148	5	10	10	10	238	10	10	519	62	10	10	10	819	1.2	5.2	5	176	315	32	*347*	*379*
20/10999	Phase 1 GW	WS317	Ground Water	3.5	17.08.20	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH306	Ground Water	5	27.08.2020	58	10	10	5	10	10	10	58	10	10	10	5	10	10	10	58	0.8	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH307	Ground Water	5	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH308	Ground Water	6.5	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH309	Ground Water	2	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH310	Ground Water	2.5	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH311	Ground Water	4.5	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH312	Ground Water	2.5	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*
20/11544	Phase 1 GW	RBH313	Ground Water	4	27.08.2020	10	10	10	5	10	10	10	10	10	10	10	5	10	10	10	10	0.1	0.5	5	1	2	1	*3*	*4*