

 T J Booth Associates. Consulting Engineers 20A Eastgate St, Rochdale OL16 1DH	Project				Job Ref.	
	2 taylors lane, bolton, BL2 6QS				calc-tjba-redford-2 taylors In-drainage strategy-290124	
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History.

Revision	Date	Reason
0	Jan 2024	Original.

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Introduction.

Reference:

Planning application for the renovation of an existing workshop into a single detached residential dwelling.

Purpose of Report:

The primary purpose of this report is to identify specific drainage proposals for parts of the proposed site in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding site assessment, this report will appraise the existing and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

General principles:

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- *infiltration*
- *watercourse*
- *public sewer*

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- *Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.*
- *Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.*
- *Development should be designed so that there is no flooding to the development in a 30yr event and so that there is no property flooding in a 100yr event considering climate change.*

Plans.

Location Plan.

The Site is in a rural location close to Brightmet, Bolton.

It comprises a former workshop and associated curtilage which is part of a larger ownership site. The Application Site and larger ownership boundary can be seen on the location plan in the Appendix.

The Site is adjacent a small watercourse to the northwest corner which flows to the west, becoming culverted approximately 160m distant, before ultimately joining Blackshaw Brook 300m west of the Site.

Site Plan.

The existing Application Site comprises a small stone workshop, surrounded by unmade hardstandings which are used as a yard and parking area.

The wider ownership boundary which doesn't form part of the Application Site is used as a storage garage, chicken coop, and yard area.

The Site has no positive surface water and the rainwater simple falls onto the ground via rain water pipes. The unmade areas are considered permeable.

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Foul drainage is to a septic tank, which is located outside the Site curtilage to the southwest corner of the existing workshop.

Existing Site areas are as follows:

- *Workshop roof area (impermeable)* 80 sqm
- *Unmade yard & hardstanding areas (permeable)* 315 sqm
- *Landscaping* 0 sqm
- *Total* 395 sqm

The proposed Site indicates the former workshop being renovated into a residential dwelling, with a small patio area to the front north side. Part of the former hardstanding yard will be turned in to soft landscaping/garden, with the remainder remaining as a driveway and associated parking.

- *Workshop roof area (impermeable)* 80 sqm
- *Drive, Patio (permeable)* 225 sqm
- *Landscaping* 90 sqm
- *Total* 395 sqm

Desk Surveys & Investigations.

Existing and proposed topography.

No topographic survey of the Site has been undertaken but the Site and local area have a natural fall towards the northwest corner.

Geology & Site Investigations.

BGS maps indicate the Site and wider local area (to the west and south) to be underlain with glacial boulder clay (Diamicton till). There is an area to the north of the Site which shows no glacial cover on BGS maps.

HR Wallingford maps suggest the Site comprises heavy clay subsoil, soil class 4.

Shallow trenching across the Site for foundations noted impermeable clay subsoil.

Drainage Surveys.

No drainage surveys have been undertaken, however photographic evidence of the surface watercourse to the west side offsite are included in the appendix.

The Site has an existing septic tank that is no longer in use, and is to be removed/abandoned.

Undertakers Sewerage Plans.

The plans confirm there is a FW manhole in the vicinity of the Site, however the invert level of the sewer is too high for connection.

Assessments.

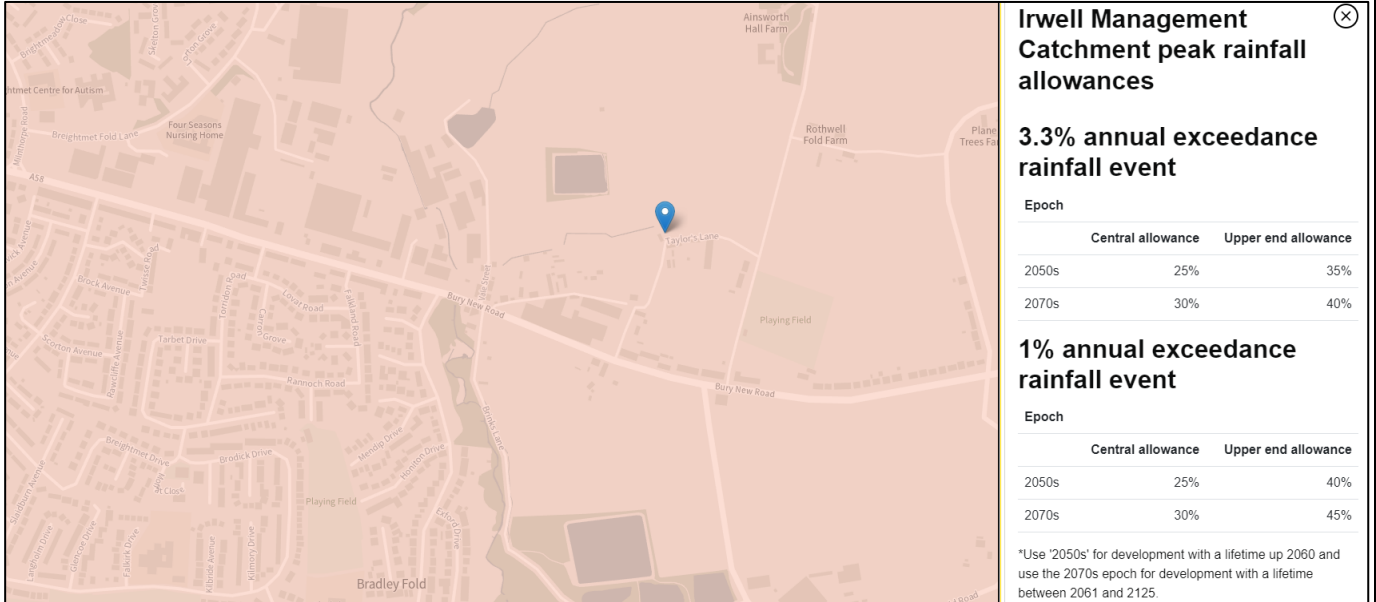
Climate change impacts.

Climate change allowances allow for uncertainty in the climate model, and the resultant change assumed through time. Allowances are thus related to the type of development and the potential lifetime expected of such development set within specific catchment areas.

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The Site is within the Irwell Management Catchment Area, and the associated climate change allowances are defined as per the map below:

Residential developments are classified within the '2070s' timeframe resulting in a 45% climate change allowance to be included on a 1% annual exceedance (100yr) rainfall event and a 40% climate change allowance to be included on the 3.3 & annual exceedance rainfall event (30yr).



Existing surface water system.

The overall existing Site comprises a 395 sqm area, and apart from the workshop roof area, runs of as greenfield flow. Currently the rainwater from the workshop runs off to the Site surface soil.

All surface water locally flows towards the west, where it flows into the minor watercourse channel. There is an unnamed minor watercourse/drainage ditch adjacent to the northwest corner of the Site. The watercourse channel has been locally infilled to form (and by the width of) an access track for the farmer fields immediately to the northwest of the Site, which causes overland flow to the access track. This doesn't cause flood issues to the Site however.

Hydrological characteristics for the site were obtained from the HR Wallingford mapping database:

SAAR (mm) ⓘ

1105

M5-60 rainfall depth (mm) ⓘ

17 ▾

'r' ratio M5-60 / M5-2day ⓘ

0.3 ▾

FEH/FSR conversion factor ⓘ

1.12

Hydrological region ⓘ

10

Specify SOIL type ⓘ

4 ▾

SPR ⓘ

0.47

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Existing Greenfield Runoff

Attenuation design in accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 1.0.04

Pre post runoff method

Site characteristics

Location	Other
Hydrological region	10
Soil type (Wallingford Procedure W.R.A.P map)	4
Standard percentage runoff	SPR = 0.47
Average annual rainfall	SAAR = 1105 mm
5 year return period rainfall of 60 minute duration	M5_60min = 17.0 mm
Ratio 60-minute to 2 day rainfalls of 5 year return	r = 0.30
Rainfall intensity increase due to global warming	p _{climate} = 0%
Routing coefficient	C _r = 1.30
Volumetric runoff coefficient	C _v = 0.75

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%)	Impermeable area (ha)
1	2 taylors lane	0.04	20.0	0.01
Total		0.04	20.0	0.01

Greenfield runoff rates

Catchment area	AREA = 50.00 hectare
Greenfield runoff rate (50 hectare site)	$\bar{Q}_{\text{rural}} = 0.00108 \text{ m}^3/\text{s} * (\text{AREA}/1\text{km}^2)^{0.89} * (\text{SAAR}/1\text{mm})^{1.17} * \text{SPR}^{2.17} =$ 411.8 l / s
Greenfield runoff rate	$\bar{Q} = \bar{Q}_{\text{rural}} / \text{AREA} * A =$ 0.3 l / s
Greenfield runoff rate per unit area	$\bar{Q}_A = \bar{Q} / A =$ 8.2 l / s / hectare

Estimated site discharges

FSR growth rate (1 year)	FSR _{1yr} = 0.87
Discharge (1 year)	Q _{1yr} = $\bar{Q} * \text{FSR}_{1\text{yr}}$ = 0.3 l/s
FSR growth rate (30 year)	FSR _{30yr} = 1.70
Discharge (30 year)	Q _{30yr} = $\bar{Q} * \text{FSR}_{30\text{yr}}$ = 0.6 l/s
FSR growth rate (100 year)	FSR _{100yr} = 2.08
Discharge (100 year)	Q _{100yr} = $\bar{Q} * \text{FSR}_{100\text{yr}}$ = 0.7 l/s

Table equations

Peak flow	Q _{post_imp} = C _r * I _{max} * A _{imp}
Runoff volume	V _{post_imp} = Q _{post_imp} * D / C _r
Post development runoff	$\bar{Q}_{\text{post}} = Q_{\text{post_imp}} + Q_{\text{post_open}}$
Permitted discharge	O _{exist} = Q * D
Post development runoff volume	I _{post} = Q _{post_open} * D + V _{post_imp}
Storage volume required	S _{post} = I _{post} - O _{exist}

Required storage for period of 1 year

Discharge per hectare	Q _{1yr_area} = Q _{1yr} / A = 7.2 l/s/hectare
Greenfield runoff rate post development	Q _{1yr_post_open} = Q _{1yr_area} * A _{imp} = 0.1 l/s

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Duration (min)	1 year rainfall (mm)	Rainfall intensity (mm/hr)	Peak flow (m³/s)	Runoff volume (m³)	Post dev. runoff (m³/s)	Permit dischrge (m³)	Post dev. runoff vol (m³)	Storage vol. reqd (m³)
5	3.6	42.9	0.00	0.3	0.00	0.08	0.30	0.21
10	5.1	30.7	0.00	0.4	0.00	0.17	0.44	0.27
15	6.1	24.5	0.00	0.5	0.00	0.25	0.53	0.28
30	8.1	16.1	0.00	0.6	0.00	0.51	0.74	0.23
60	10.7	10.7	0.00	0.8	0.00	1.02	1.05	0.03
120	13.7	6.9	0.00	1.1	0.00	2.04	1.49	-0.55
240	17.8	4.4	0.00	1.4	0.00	4.08	2.22	-1.85
360	20.6	3.4	0.00	1.6	0.00	6.11	2.85	-3.26
600	24.9	2.5	0.00	2.0	0.00	10.19	4.01	-6.18
1440	34.6	1.4	0.00	2.7	0.00	24.45	7.62	-16.83

Attenuation storage required

Vol. increase due to head-discharge relationship

$$p_{hydro} = 1.25$$

Maximum attenuation storage required

$$V_{req_max} = V_{max_1yr} * p_{hydro} = 0.3 \text{ m}^3$$

Required storage for period of 30 year

Discharge per hectare

$$Q_{30yr_area} = Q_{30yr} / A = 14.0 \text{ l/s/hectare}$$

Greenfield runoff rate post development

$$Q_{30yr_post_open} = Q_{30yr_area} * A_{imp} = 0.1 \text{ l/s}$$

Duration (min)	30 year rainfall (mm)	Rainfall intensity (mm/hr)	Peak flow (m³/s)	Runoff volume (m³)	Post dev. runoff (m³/s)	Permit dischrge (m³)	Post dev. runoff vol (m³)	Storage vol. reqd (m³)
5	8.3	99.6	0.00	0.7	0.00	0.17	0.69	0.52
10	12.2	73.4	0.00	1.0	0.00	0.33	1.03	0.70
15	14.9	59.8	0.00	1.2	0.00	0.50	1.28	0.78
30	19.8	39.6	0.00	1.6	0.00	1.00	1.76	0.77
60	26.1	26.1	0.00	2.1	0.00	1.99	2.46	0.47
120	32.7	16.4	0.00	2.6	0.00	3.98	3.38	-0.60
240	40.7	10.2	0.00	3.2	0.00	7.96	4.81	-3.15
360	45.8	7.6	0.00	3.6	0.00	11.95	6.00	-5.94
600	53.5	5.4	0.00	4.2	0.00	19.91	8.21	-11.70
1440	68.9	2.9	0.00	5.4	0.00	47.78	15.00	-32.78

Attenuation storage required

Vol. increase due to head-discharge relationship

$$p_{hydro} = 1.25$$

Maximum attenuation storage required

$$V_{req_max} = V_{max_30yr} * p_{hydro} = 1.0 \text{ m}^3$$

Required storage for period of 100 year

Discharge per hectare

$$Q_{100yr_area} = Q_{100yr} / A = 17.1 \text{ l/s/hectare}$$

Greenfield runoff rate post development

$$Q_{100yr_post_open} = Q_{100yr_area} * A_{imp} = 0.1 \text{ l/s}$$

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Duration (min)	100 year rainfall (mm)	Rainfall intensity (mm/hr)	Peak flow (m³/s)	Runoff volume (m³)	Post dev. runoff (m³/s)	Permit dischrge (m³)	Post dev. runoff vol (m³)	Storage vol. reqd (m³)
5	10.5	125.5	0.00	0.8	0.00	0.20	0.87	0.66
10	15.6	93.5	0.00	1.2	0.00	0.41	1.31	0.91
15	19.2	76.6	0.00	1.5	0.00	0.61	1.64	1.03
30	25.6	51.3	0.00	2.0	0.00	1.22	2.27	1.05
60	34.1	34.1	0.00	2.7	0.00	2.44	3.18	0.75
120	43.0	21.5	0.00	3.4	0.00	4.87	4.37	-0.50
240	53.3	13.3	0.00	4.2	0.00	9.74	6.16	-3.59
360	59.5	9.9	0.00	4.7	0.00	14.62	7.63	-6.99
600	69.3	6.9	0.00	5.5	0.00	24.36	10.34	-14.02
1440	88.1	3.7	0.00	7.0	0.00	58.47	18.65	-39.82

Attenuation storage required

Vol. increase due to head-discharge relationship p_{hydro} = **1.25**
Maximum attenuation storage required V_{req_max} = V_{max_100yr} * p_{hydro} = **1.3 m³**

Interception storage

Interception rainfall depth d_{int} = **5 mm**
Volume of interception storage required V_{int_req} = 0.8 * A_{imp} * d_{int} = **0.32 m³**

Pass Forward Flow Rates:

Flow rates from the Site are minimal as per the above calculations, and no changes to permeable/impermeable areas are proposed.

It is not considered necessary to impose maximum flow rates due to the small flows noted in the assessment.

Proposed Surface Water System.

Following the guidance of hierarchy for disposal of surface water (SUDS):

- INFILTRATION:** BGS maps indicate the subsoils comprise clays locally with some minor made ground used as surface material in former hardstanding areas.

Mass infiltration via soakaway systems is not considered feasible for impermeable roof areas due to the underlying clay, and made ground is not deep enough to construct traditional soakaways.

However, those areas that are in contact with the ground surface such as driveways & paths etc, which can transfer rainwater directly to the ground surface, can be employed both over made ground and even over clayey soil mimicking the greenfield scenario & reducing the reliance on watercourses by utilising shallow subbase volume. It is proposed that the drive area & patio should be permeable.
- WATERCOURSE:** There is a local watercourse to the west of the Site. It is proposed that the drainage from the proposed dwelling should be formalised, and piped to a combined manhole on Site (along with the outflow from a new Site package treatment plant, see next sect). This should then be discharge via suitable drainage pipes beneath the farmers track, into the open watercourse/drainage channel.
- Due to the small areas and associated surface water flows involved, it is not considered necessary to restrict flows.
- SEWER:** There are only combined sewers locally.

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Proposed Foul Water System.

Foul water flows from the proposed development will be kept separate from surface water flows, combined at the last manhole, and discharged into the local surface water management drains which ultimately discharge into the local watercourse.

To do this, the Site will utilise a package sewage treatment plant (PSTP).

The proposed development is for a residential dwelling with 2No. bedrooms.

Package treatment plants are sized in accordance with British Water Flows & Loads 4.

Regarding domestic housing specifically, treatment systems for a single house with up to and including 3 bedrooms are designed for a minimum population (P) of 5 people. For single dwellings with more than 3 bedrooms, an additional 1 P is added for each additional bedroom.

Given the proposed dwelling has 2 bedrooms, this equates to a population equivalent of 5P.

The expected loadings from such a system are as follows:

Per person/activity/day		Flow (l/d)		BOD (g)		Ammonia (N)	
	Population (P)	per head	total	per head	total	per head	total
Domestic standard residential	5	150	750	60	300	8	40

The package sewage treatment plant identified for the Site is a GRAF SBR-treatment one2clean for 3-18 inhabitants, suitable to treat loads of 0.06kg/d (60g) BOD, and 0.15m³/d (150l) per person up to 18 people. Refer to PSTP certification in the Appendix.

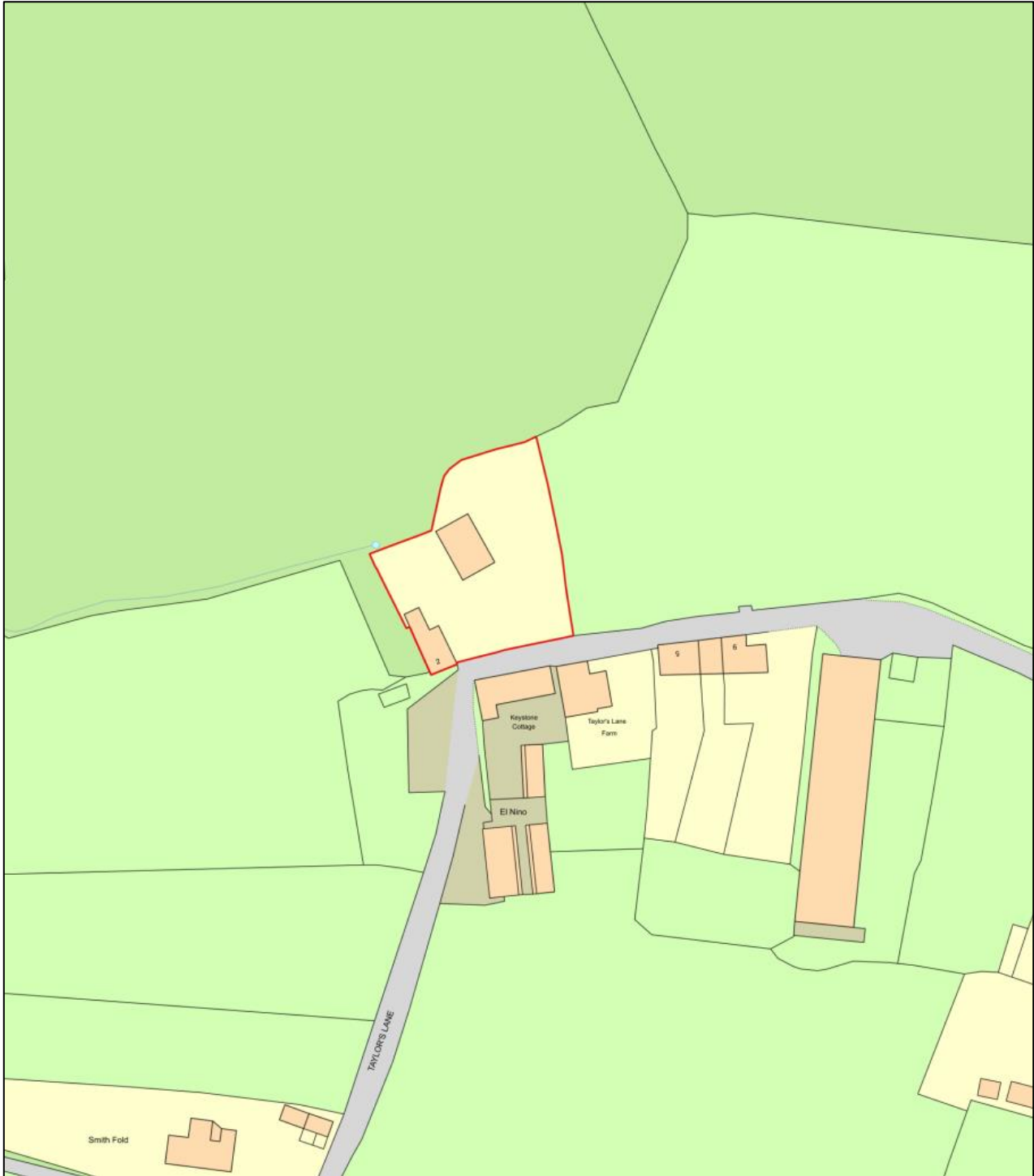
Additional Recommendations.

This report should be issued to the LPA/B.Control for approval prior to construction.

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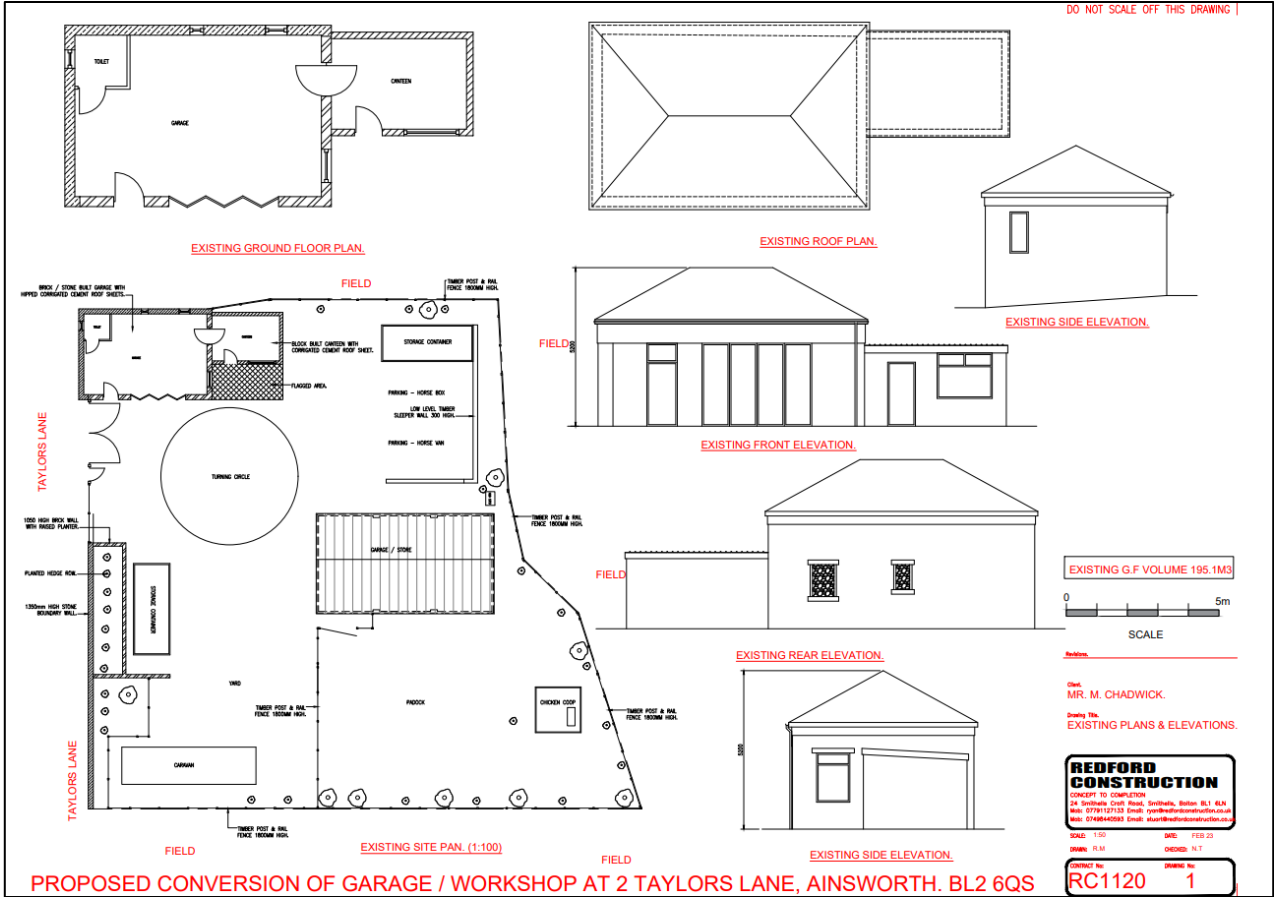
Appendix.

Location Plan.



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Existing Site Plans.



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Photos.

