GROSSART ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

PROPOSED NEW BUILD GREYSTONE RD ALFORD, ABERDEENSHIRE COUNCIL

DRAINAGE ASSESSMENT

Grossart Associates Ref: 13248

Revision: P01

Issue Date: 29 January 2024

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Control Sheet

Rev	Description	Issued by	Checked	Date
01	First Issue	CVB	DF	29/01/2024

Author	Signature	Date
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1.0 Introduction

1.1 Project Background

1.1.1 Grossart Associates have been appointed by The Richmond Fellowship Scotland to prepare a Drainage Assessment (DA) to support a planning application for a new proposed build at Greystone Rd, Alford, Aberdeenshire Council.

1.1.2 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.1.3 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Grossart Associates shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Grossart Associates.

1.2 Scope of Assessment

1.2.1 This Drainage Assessment has been undertaken in accordance with the standing advice and requirements of the Scottish Environment Protection Agency (SEPA), Scottish Planning Policy, Aberdeenshire Council's planning guidance and Sewer for Scotland 4th Edition.

1.2.2 The report prepares outline design proposals for foul and surface water drainage of the site.

1.2.3 The report reviews the following information:

- The Aberdeenshire Council local development plan and guidance;
- Scottish Water Public Sewer Records;
- Scottish Planning Policy (SPP) (June 2014);
- Sewer for Scotland 4th Edition;
- CIRIA Manual c753;

1.3 Proposed Development

1.3.1 The proposed development comprises the demolition of the existing buildings and the erection of new 2No housing blocks, with the associated landscaping and car parking.

1.3.2 The proposed development plan is included in Appendix A.

2.0 Existing Site Details

2.1 History and Current Use

2.1.1 The Ordnance Survey grid reference for the site is 357244, 815964. The site location is shown in Figure 2-1.

2.1.2 The site comprises an occupied brownfield site, with an approximately area of 0.14ha.

2.1.3 The site is bounded by the Greystone Rd to the south, by David Mclean Dr to the west and by existing residential properties by its northern and eastern site boundary.

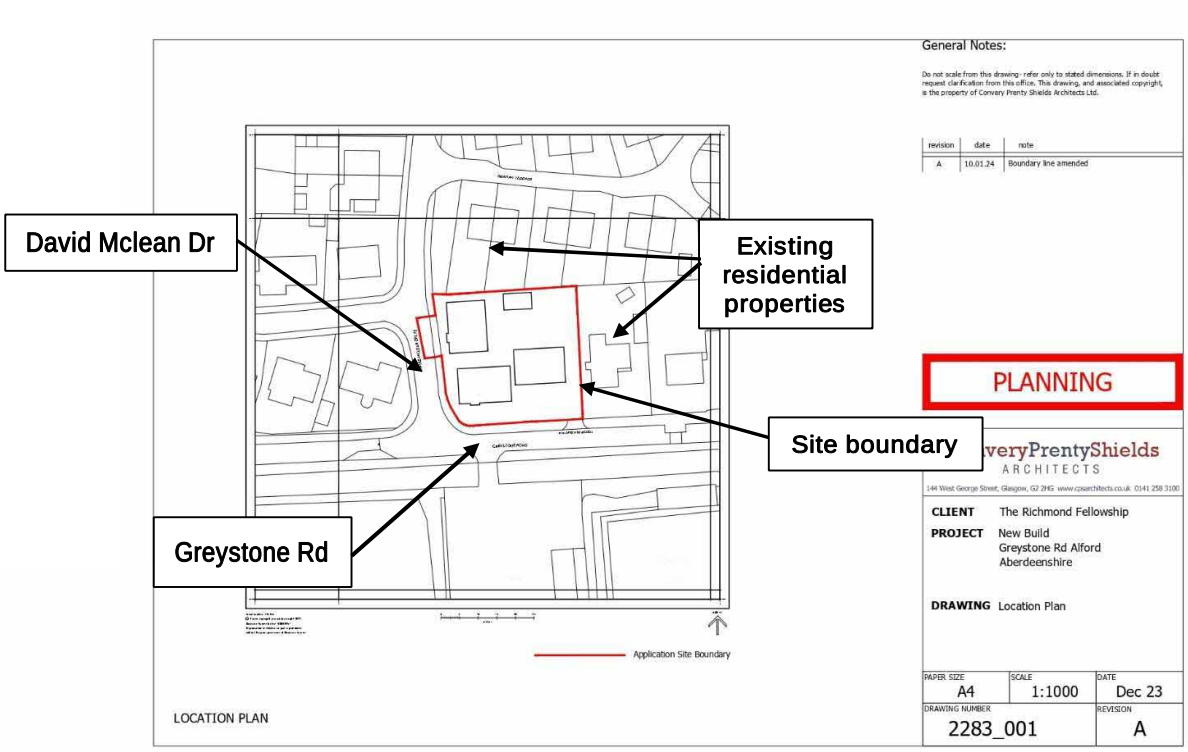


Figure 2-1. site location (source: osmaps.ordnancesurvey).

2.2 Existing Drainage

2.2.1 The public sewer and water records have been obtained from the Scottish Water (SW) GIS plans. The records show an existing Scottish Water foul and surface water sewers running to the west of the site along David Mclean Dr following a northerly direction. An existing public combined sewer running easterly is also present underneath Greystone Rd, to the south of the site.

2.2.2 The Scottish Water records are included within Appendix B.

2.3 Topography

2.3.1 No topographical survey is available at the time of writing however, a review of the OS Mapping along with Google Street View has been undertaken. This indicates the site to be between contour 156m and 155m, falling generally northwards with Greystone Rd sitting relatively higher than the site area. David Mclean Dr also falls from a level above 156m to approximately 155.5mAOD in a northernly direction according the Scottish Water records.

2.4 Existing Watercourses

2.4.1 There is an unnamed ditch/watercourse running northerly approximately 60m to the east of the north-eastern site corner. This unnamed ditch/watercourse appears to discharge into the Knowehead Burn to the east of the site.

2.5 Ground Conditions

2.5.1 No SI is available at the time of writing.

3.0 Drainage Strategy

3.1 National Planning Framework 4

3.1.1 The National Planning Framework 4 (NPF4) is a long term plan looking to 2045 that guides spatial development, sets out national planning policies, designate national developments and highlight regional spatial priorities. It is part of the development plan, and so influences planning decisions across Scotland. The NPF4 was published in February 2023 and incorporates updated Scottish Planning Policy, containing detailed national policy on a number of planning topics. For the first time, spatial and thematic planning policies are addressed in one place. This document is intended to be used in conjunction with Local Development Plans (LDPs), Planning Advice Notes (PANs), and Design Advice Guidance (DAG).

3.1.2 The guidance relating to flooding (NPF4) is summarised in terms of the flood risk to a proposed development in the following extracts.

3.2 Risk Framework

3.2.1 "*For planning purposes, at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for future climate change. This risk of flooding is indicated on SEPA's future flood maps or may need to be assessed in a flood risk assessment. An appropriate allowance for climate change should be taken from the latest available guidance and evidence available for application in Scotland. The calculated risk of flooding can take account of any existing, formal flood protection schemes in determining the risk to the site. Where the risk of flooding is less than this threshold, areas will not be considered 'at risk of flooding' for planning purposes, but this does not mean there is no risk at all, just that the risk is sufficiently low to be acceptable for the purpose of planning. This includes areas where the risk of flooding is reduced below this threshold due to a formal flood protection scheme.* "

3.2.2 This includes flooding to be assessed from all sources*:*

"*Watercourse /Fluvial Flooding – caused by excessive rainfall or snow melt within a limited period, which overwhelms the capacity of the watercourse or river channel, particularly when the ground is already saturated. It can also arise as a result of the blockage of a channel and/or associated structures such as small bridges and culverts;*

Pluvial Flooding – occurs when rainwater ponds or flows over the ground (overland flow) before it enters a natural or man-made drainage systems (e.g. a river or

sewer/drain). It can also occur when drainage systems are at full capacity. It is often combined with sewer flooding and groundwater flooding;

Sewer Flooding – occurs when the sewerage infrastructure has to deal with loads beyond its design capacity. This occurs most often as a result of high intensity rainfall events;

Groundwater Flooding – occurs when the water table rises above ground level. In Scotland this is most commonly associated with the movement of water through sands and gravels, often connected to the rise and fall of river levels; and

Coastal Flooding – occurs as a result of high tide, storm surge and wave activity raising the level of the sea above adjoining land.

3.2.3 Policy 2 Climate Mitigation and Adaptation states that "*Development proposals will be sited and designed to adapt to current and future risks from climate change*".

3.2.4 Policy 3 Biodiversity states that "*Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them. Proposals should also integrate nature-based solutions, where possible.*" and "*Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. This will take into account the need to reverse biodiversity loss, safeguard the ecosystem services that the natural environment provides, and build resilience by enhancing nature networks and maximising the potential for restoration.*"

3.2.5 Coastal Development defines the following principles in Policy 10:

3.2.6 "*a) Development proposals in developed coastal areas will only be supported where the proposal:*

i. does not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and

ii. is anticipated to be supportable in the long-term, taking into account projected climate change.

3.2.7 *b) Development proposals in undeveloped coastal areas will only be supported where they:*

i. are necessary to support the blue economy, net zero emissions or to contribute to th economy or wellbeing of communities whose livelihood depend on marine or coastal activities, or is for essential infrastructure, where there is a specific locational need and no other suitable site;

ii. do not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and

iii. are anticipated to be supportable in the long-term, taking into account projected climate change; or

iii. *are designed to have a very short lifespan.*

3.2.8 *Development proposals for coastal defence measures will be supported if:*

i. they are consistent with relevant coastal or marine plans;

ii. nature-based solutions are utilised and allow for managed future coastal change wherever practical; and

iii. any in-perpetuity hard defense measures can be demonstrated to be necessary to protect essential assets.

3.2.9 *d) Where a design statement is submitted with any planning application that may impact on the coast it will take into account, as appropriate, long-term coastal vulnerability and resilience."*

3.2.10 Under Flood Risk and Water Management, Policy 22 sets out the following principles:

3.2.11 *" a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:*

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long-term safety and resilience can be secured in accordance with relevant SEPA advice.

The protection offered by an existing formal flood protection scheme or one under construction can be taken into account when determining flood risk. In such cases, it will be demonstrated by the applicant that:

- *all risks of flooding are understood and addressed;*
- *there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;*
- *the development remains safe and operational during floods;*
- *flood resistant and resilient materials and construction methods are used; and*
- *future adaptations can be made to accommodate the effects of climate change.*

Additionally, for development proposals meeting criteria part iv), where flood risk is managed at the site rather than avoided these will also require:

- *the first occupied/utilised floor, and the underside of the development if relevant, to be above the flood risk level and have an additional allowance for freeboard; and*
- *that the proposal does not create an island of development and that safe access/egress can be achieved.*

3.2.12 *b) Small scale extensions and alterations to existing buildings will only be supported where they will not significantly increase flood risk.*

3.2.13 *c) Development proposals will:*

i. not increase the risk of surface water flooding to others, or itself be at risk.

ii. manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-green infrastructure. All proposals should presume no surface water connection to the combined sewer;

iii. seek to minimise the area of impermeable surface.

3.2.14 *d) Development proposals will be supported if they can be connected to the public water mains. If connection is not feasible, the applicant will need to demonstrate that water for drinking water purposes will be sourced from a sustainable water source that is resilient to periods of water scarcity.*

3.2.15 *e) Development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported."*

3.3 Local Planning Policy

3.3.1 The Aberdeenshire Council "Drainage Impact Assessment" published in March 2022 outlines the requirements for development proposals to manage the surface water drainage. The basic requirements are as follows:

- *an examination of the current and historical drainage patterns;*
- *a concept drawing of the development proposal;*
- *a brief summary of how the drainage design provides SUDS techniques in accordance with the design manual;*
- *summary of SUDS to be incorporated (refer to the selection tool within the design manual);*
- *the soil classification for the site;*
- *evidence of subsoil porosity tests including where possible at the*
- *location of any intended infiltration device;*
- *calculations showing the pre- and post-development peak run-off flow rate for the critical rainfall event (refer to section 3);*
- *attenuation designed for a 10 year return period rainfall event;*
- *wastewater drainage proposals;*
- *confirmation of maintenance responsibility; and*
- *a copy of a letter from the water authority giving the location of the*
- *nearest public sewers and confirmation of their availability for servicing the site.*

3.4 Climate Change

3.4.1 The latest Climate Change Allowances for Flood Risk Assessment in Land Use Planning published by SEPA and updated in April 2022 recommends a 37% uplift for peak rainfall intensity for the North East Scotland Catchment.

4.0 Drainage Strategy

4.1 Proposed Surface Water Drainage

4.1.1 Any new development site drainage will be designed in accordance with Sewer for Scotland v4.0, as the proposal is to discharge into the existing Scottish Water system, to provide enough network capacity up to and including the 1 in 30 year event plus 30% allowance for climate change, as per Sewer for Scotland v4.0. Additionally, the system will be checked for the 1 in 200 year event plus 37% climate change, latest SEPA CC's allowances, with any predicted flooding to be accommodated within the application site without detriment to properties and providing safe access from and to the site at all times.

4.1.2 In following the standard hierarchy of drainage solutions outlined by Scottish Water Surface Water Policy, consideration has firstly been given to storing and reusing the surface water on site. However, the water demand for non-potable water it is expected not to be significant (Option 1) for 2No housing units.

4.1.3 The preferred option 2 is the surface water to drain into the soil through the use of a soakaway. However, as a conservative approach, this has been considered unfeasible at this stage pending of the receipt of any Site Investigations recommendations.

4.1.4 The preferred option 3 is for the surface water to drain into a watercourse, canal, loch or existing/proposed SuDS, however, none are present.

4.1.5 The proposal is to discharge into the existing Scottish Water surface water sewer present along David Mclean Dr (Option 4).

4.2 Allowable Discharge Rate

4.2.1 The surface water will be attenuated within the surface water drainage system to the equivalent existing pre-development rural runoff rate (QBAR).

4.2.2 Using the ICP SuDS method in the Micro Drainage software package, the pre-development green-field rural discharge was calculated for the catchment area. The Q rural values are summarised in Table 4-4 along with the runoff for the 30 year event + 30% climate change.

Catchment Area:	Total Impermeable Area (ha):	QBAR greenfield-field runoff rural (l/s):	Total Attenuation provided (m^3):	Discharge to:
0.14	0.14	0.7	68	Existing SW surface water sewer

Table 4-4. QBAR greenfield runoff, existing Q30 +39%, attenuation and discharge for the site.

4.2.3 MicroDrainage output sheets are included within Appendix C.

4.2.4 The proposal is to limit the discharge to 2.5 l/s up to and including the 1 in 30year plus 30% climate change to provide a minimum orifice diameter of 75mm to prevent blockage on site.

4.2.5 The proposed drainage scheme shows a surface water discharge, treated and attenuated, into the existing Scottish Water surface water sewer along David Mclean Dr.

4.3 Surface Water Treatment Levels

4.3.1 SEPA highlights the legal requirement for the treatment of surface water by sustainable drainage systems (SUDS) for most types of development and encourage surface water runoff from developments to be treated in line with Scottish Planning Policy.

4.3.2 Consideration of SUDS requirements early in the planning process allows for greater flexibility and means the layout can be adopted to accommodate SUDS features, avoiding potential expense to the developer at a later stage.

4.3.3 CIRIA report C753 ‘The SUDS Manual’ (2015) provides guidance on assessing pollution hazard indices for various land uses and the type of SUDS solutions required to mitigate those hazards. Each activity or land use has pollution indices, whilst each SUDS component has corresponding mitigation indices, for total suspended solids, metals and hydrocarbons. Sufficient treatment measures should be provided, such that the mitigation indices are greater than or equal to the pollution indices.

4.3.4 Per the manual, residential roofing has a pollution hazard level of ‘Very Low’. The hazard index for total suspended solids (TSS) is 0.2, for metals is 0.2 and for hydrocarbons is 0.05. Treatment will be provided via the filter media underneath the proposed permeable paving structure.

4.3.5 Low traffic roads (<300 traffic movements a day) have a pollution hazard level of 'Low'. The hazard index for total suspended solids (TSS) is 0.5, for metals is 0.4 and for hydrocarbons is 0.4. Treatment will be provided via permeable paving.

4.3.6 And individual driveways have a pollution hazard level of 'Low'. The hazard index for total suspended solids (TSS) is 0.5, for metals is 0.4 and for hydrocarbons is 0.4. Treatment will be provided via permeable paving.

Pollution Hazard Indices				
Land Use Type	**Hazard Level**	**Suspended Solids**	**Metals**	**Hydrocarbons**
Residential roofing	Very Low	0.3	0.2	0.05
Individual Driveways	Low	0.5	0.4	0.4
Low traffic roads (<300 traffic movements a day)	Low	0.5	0.4	0.4
Pollution Mitigation Indices				
SuDS Component Description		**Suspended Solids**	**Metals**	**Hydrocarbons**
Filter Drain		0.4	0.4	0.5
Permeable Paving		0.7	0.6	0.7

Table 4-3. Simple Index Approach (SIA).

4.3.7 All mitigation indices exceed the pollution hazards indices as per SIA index table shown above.

4.4 Proposed Foul Water Drainage

4.4.1 The new proposed foul drainage from the development, will discharge via a new proposed disconnecting manhole into the existing foul water present at David Mclean Drive.

4.4.2 A Pre-Development Enquiry will be submitted to Scottish Water to confirm acceptance in flows.

4.5 Conflict with Existing Sewers and water mains

4.5.1 Sewers for Scotland 4th Edition states, under the terms of the Building Regulations 2004 (as amended), there is a requirement to avoid construction over existing sewers, or to otherwise cause damage to them through construction nearby.

4.5.2 There are no existing Scottish Water assets within the site in accordance with the Scottish Water GIS records, therefore no protection is anticipated to be required.

4.6 Maintenance Requirements

4.6.1 The proposed new surface and foul water sewer network, including the SuDS elements, will remain private and maintained by the developer (The Richmond Fellowship).

4.6.2 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented. Unless under management of a factor or management company, the SUDS solutions will require to satisfy the requirements of Aberdeenshire Council and SEPA.

4.6.3 It is recommended that the drainage system is inspected a minimum of twice per year, or, as per the manufacturers guidelines, with the system also being inspected after any major storm event. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

4.6.4 The CIRIA SUDS Manual 2015 provides guidance on the maintenance requirements for SUDS features.

5.0 Conclusions and Recommendations

5.1 Conclusions

5.1.1 Grossart Associates have been appointed by The Richmond Fellowship Scotland, to prepare a Drainage Assessment (DA) to support a planning application for a new proposed build at Greystone Rd, Alford, Aberdeenshire Council.

5.1.2 The proposed development comprises the demolition of the existing buildings and the erection of new 2No housing blocks, with the associated landscaping and car parking.

5.1.3 The public sewer and water records have been obtained from the Scottish Water (SW) GIS plans. The records show an existing Scottish Water foul and surface water sewers running to the west of the site along David Mclean Dr following a northerly direction. An existing public combined sewer running easterly is also present underneath Greystone Rd, to the south of the site.

5.1.4 Any new development site drainage will be designed in accordance with Sewer for Scotland v4.0, as the proposal is to discharge into the existing Scottish Water system, to provide enough network capacity up to and including the 1 in 30 year event plus 30% allowance for climate change, as per Sewer for Scotland v4.0. Additionally, the system will be checked for the 1 in 200 year event plus 37% climate change, latest SEPA CC's allowances, with any predicted flooding to be accommodated within the application site without detriment to properties and providing safe access from and to the site at all times.

5.1.5 The proposal is to limit the discharge to 2.5 l/s up to and including the 1 in 30year plus 30% climate change to provide a minimum orifice diameter of 75mm to prevent blockage on site. 68m^3 of attenuation will be provided on site.

5.1.6 Treatment will be provided via filtration media and permeable paving. All mitigation indices exceed the pollution hazards indices as per SIA index tool.

5.1.7 A Pre-Development Enquiry will be submitted to Scottish Water to confirm acceptance in flows.

5.1.8 There are no existing Scottish Water assets within the site in accordance with the Scottish Water GIS records, therefore no protection is anticipated to be required.

5.1.9 The proposed new surface and foul water sewer network, including the SuDS elements, will remain private and maintained by the developer (The Richmond Fellowship Scotland).

5.2 Recommendations

5.2.1 A PDE shall be submitted to Scottish Water to confirm there are no issues in the receiving network to accommodate the new flows.

5.2.2 This Drainage Strategy shall be reviewed following any SI works and if possible, infiltration shall be incorporated into the drainage design.

5.2.3 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented. Unless under management of a factor or management company, the SUDS solutions will require to satisfy the requirements of Aberdeenshire Council and SEPA.

Appendix A –Proposed Site Plans

PROPOSED SITE PLAN

General Notes:

Do not scale from this drawing- refer only to stated dimensions. If in doubt request clarification from this office. This drawing, and associated copyright, is the property of Convery Prenty Shields Architects Ltd.

revision	date	note
A	10.01.24	Boundary line amended

Materials Key:

- Lawn Grass
  Seed/Turf
- Road Surface
  Concrete Block Paving Herringbone
  400x200
  Colour - Standard Grey
- Parking Bays
  Concrete Block Paving Herringbone
  400x200
  Colour - Buff
- Pavements
  Standard Tarmac
  Colour - Standard Grey
- Paths
  Concrete Standard Flag
  600x600
  Colour - Silver Grey

Application Site Boundary

PLANNING

ConveryPrentyShields
ARCHITECTS
144 West George Street, Glasgow, G2 2HG www.cpsarchitects.co.uk 0141 258 3100

CLIENT The Richmond Fellowship

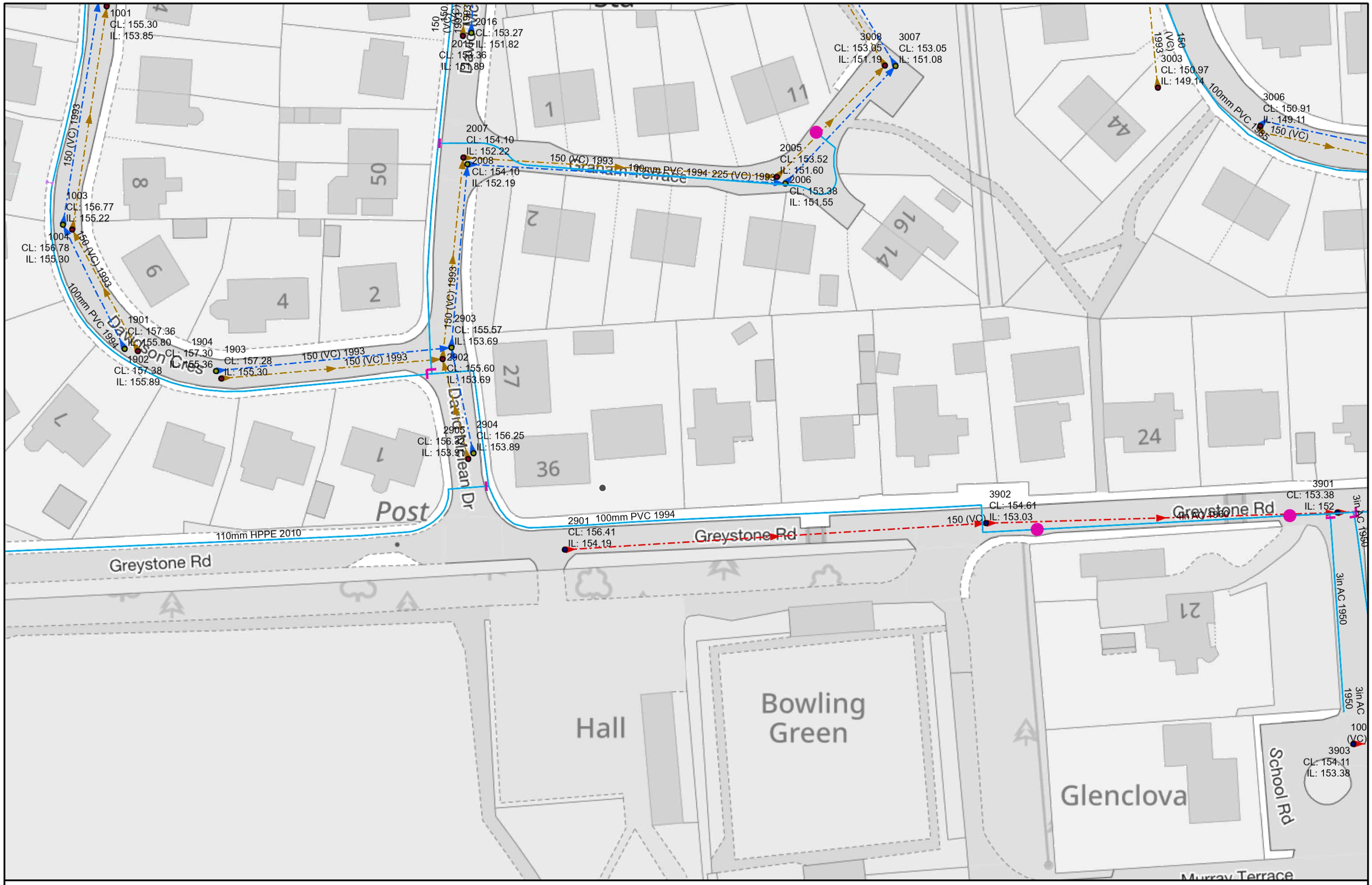
PROJECT New Build
Greystone Rd Alford
Aberdeenshire

DRAWING Site Plan
as Proposed

PAPER SIZE	SCALE	DATE
A3	1:200	Dec 23

DRAWING NUMBER	REVISION
2283_005	A

Appendix B –Public Sewer Records



Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: carlosvbesada@gmail.com

The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.

Date: 29/01/2024

Alford New Housing

0 3.25 6.5 13 Meters

SCALE: 1:661

Scottish Water
Trusted to serve Scotland
The Bridge
6 Buchanan Gate
Steps
Glasgow
G33 6FB
Tel No: 08000 778 778

Appendix C –MicroDrainage Outputs

ICP SUDS Mean Annual Flood

Input

Return Period (years) 30 SAAR (mm) 985 Urban 0.000
Area (ha) 0.140 Soil 0.400 Region Number Region 1

Results l/s

QBAR Rural 0.7
QBAR Urban 0.7

Q30 years 1.3

Q1 year 0.6
Q30 years 1.3
Q100 years 1.8

Summary of Results for 200 year Return Period (+37%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	18.764	0.264	2.5	22.5	O K
30 min Summer	18.881	0.381	2.5	32.4	O K
60 min Summer	19.006	0.506	2.5	43.0	O K
120 min Summer	19.112	0.612	2.5	52.1	O K
180 min Summer	19.155	0.655	2.5	55.7	O K
240 min Summer	19.174	0.674	2.5	57.3	O K
360 min Summer	19.192	0.692	2.5	58.8	O K
480 min Summer	19.195	0.695	2.5	59.1	O K
600 min Summer	19.191	0.691	2.5	58.7	O K
720 min Summer	19.183	0.683	2.5	58.1	O K
960 min Summer	19.161	0.661	2.5	56.2	O K
1440 min Summer	19.104	0.604	2.5	51.3	O K
2160 min Summer	18.990	0.490	2.5	41.6	O K
2880 min Summer	18.871	0.371	2.5	31.5	O K
4320 min Summer	18.719	0.219	2.5	18.6	O K
5760 min Summer	18.642	0.142	2.4	12.1	O K
7200 min Summer	18.605	0.105	2.2	8.9	O K
8640 min Summer	18.591	0.091	2.0	7.7	O K
10080 min Summer	18.581	0.081	1.8	6.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.660	0.0	24.7	24
30 min Summer	69.027	0.0	36.0	38
60 min Summer	47.296	0.0	49.6	66
120 min Summer	30.997	0.0	65.0	124
180 min Summer	23.958	0.0	75.4	180
240 min Summer	19.903	0.0	83.5	212
360 min Summer	15.271	0.0	96.1	278
480 min Summer	12.632	0.0	106.0	346
600 min Summer	10.896	0.0	114.3	416
720 min Summer	9.653	0.0	121.5	486
960 min Summer	7.972	0.0	133.8	626
1440 min Summer	6.085	0.0	153.2	904
2160 min Summer	4.634	0.0	175.1	1304
2880 min Summer	3.813	0.0	192.1	1648
4320 min Summer	2.892	0.0	218.5	2336
5760 min Summer	2.376	0.0	239.4	3000
7200 min Summer	2.040	0.0	257.0	3680
8640 min Summer	1.802	0.0	272.3	4408
10080 min Summer	1.623	0.0	286.1	5136

Summary of Results for 200 year Return Period (+37%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	18.799	0.299	2.5	25.4	O K
30 min Winter	18.932	0.432	2.5	36.7	O K
60 min Winter	19.075	0.575	2.5	48.9	O K
120 min Winter	19.199	0.699	2.5	59.4	O K
180 min Winter	19.254	0.754	2.5	64.1	O K
240 min Winter	19.279	0.779	2.5	66.2	O K
360 min Winter	19.295	0.795	2.5	67.5	O K
480 min Winter	19.295	0.795	2.5	67.6	O K
600 min Winter	19.284	0.784	2.5	66.6	O K
720 min Winter	19.267	0.767	2.5	65.2	O K
960 min Winter	19.224	0.724	2.5	61.5	O K
1440 min Winter	19.122	0.622	2.5	52.9	O K
2160 min Winter	18.914	0.414	2.5	35.2	O K
2880 min Winter	18.756	0.256	2.5	21.7	O K
4320 min Winter	18.615	0.115	2.3	9.8	O K
5760 min Winter	18.586	0.086	2.0	7.3	O K
7200 min Winter	18.574	0.074	1.7	6.3	O K
8640 min Winter	18.567	0.067	1.5	5.7	O K
10080 min Winter	18.562	0.062	1.3	5.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	94.660	0.0	27.6	24
30 min Winter	69.027	0.0	40.4	38
60 min Winter	47.296	0.0	55.5	66
120 min Winter	30.997	0.0	72.8	122
180 min Winter	23.958	0.0	84.4	178
240 min Winter	19.903	0.0	93.5	230
360 min Winter	15.271	0.0	107.6	290
480 min Winter	12.632	0.0	118.7	368
600 min Winter	10.896	0.0	128.0	448
720 min Winter	9.653	0.0	136.1	526
960 min Winter	7.972	0.0	149.9	678
1440 min Winter	6.085	0.0	171.6	976
2160 min Winter	4.634	0.0	196.1	1364
2880 min Winter	3.813	0.0	215.1	1680
4320 min Winter	2.892	0.0	244.7	2292
5760 min Winter	2.376	0.0	268.1	2944
7200 min Winter	2.040	0.0	287.8	3672
8640 min Winter	1.802	0.0	305.0	4320
10080 min Winter	1.623	0.0	320.5	5104

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	200	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.000	Shortest Storm (mins)	15
Ratio R	0.215	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+37

Time Area Diagram

Total Area (ha) 0.140

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.047	4	8	0.047	8	12	0.047

Model Details

Storage is Online Cover Level (m) 20.000

Tank or Pond Structure

Invert Level (m) 18.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	85.0	0.800	85.0	0.801	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0078-2500-0800-2500
Design Head (m)	0.800
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	78
Invert Level (m)	18.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	2.5	Kick-Flo®	0.508	2.0
Flush-Flo™	0.236	2.5	Mean Flow over Head Range	-	2.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

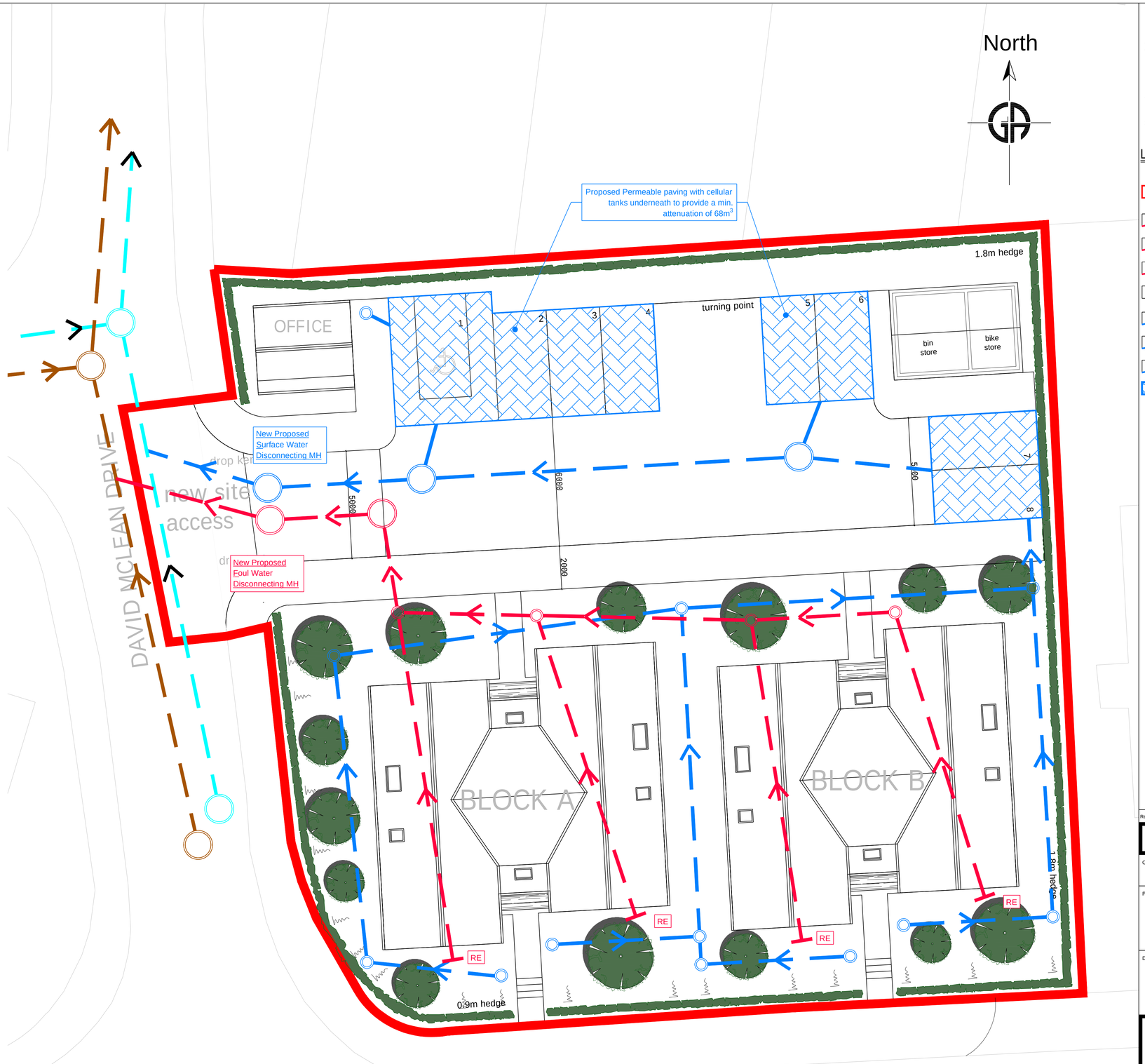
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	1.200	3.0	3.000	4.6	7.000	6.9
0.200	2.5	1.400	3.2	3.500	4.9	7.500	7.1
0.300	2.5	1.600	3.4	4.000	5.3	8.000	7.3
0.400	2.4	1.800	3.6	4.500	5.6	8.500	7.5
0.500	2.1	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.2	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.4		
1.000	2.8	2.600	4.3	6.500	6.6		

Appendix D –Proposed Drainage Strategy

DRAINAGE STRATEGY NOTES:

This proposed drainage strategy is based upon the following;

1. Strategy as per Aberdeenshire Council local development plan and guidance, "Drainage Impact Assessment" published in March 2002.
2. The proposed site area has been calculated to be 0.14 Ha.
3. Pre-Development existing runoff rate (Qbar) has been calculated to be 0.7 l/s for the site area. Proposed surface water discharge will be limited to 2.5 l/s up to and including the 1 in 30yr plus 30% CC to provide a minimum orifice diameter of 75mm to prevent blockage.
4. Strategy to provide capacity with no flooding up to and including the 1:200year storm event plus 37% climate change, latest SEPA CC allowances.
5. The new SEPA Climate Change Allowances for Flood Risk Assessment in Land Use Planning Guidance indicates a 37% of Peak Rainfall Intensity allowance for the North East Scotland Catchment therefore, the strategy is complying with SEPA requirements with regards to climate change.
6. As the proposal is to discharge into the existing Scottish Water surface water system along David Mclean Drive, the discharge will be limited to 2.5 l/s up to and including the 1 in 30yr event plus 30% CC in line with Sewer for Scotland 4.0.
7. Attenuation will be provided via proposed permeable paving and cellular tanks for total volume of 68m^3.
8. Surface water treatment will be achieved via permeable paving for car parking bays and access road and via the filtration media of the proposed permeable paving structures for the building roofing.
9. Proposed on-site drainage systems including the SuDS elements, to be maintained private and maintained by the developer.
10. This drainage strategy is to be noted as indicative at this stage and may be subject to alterations during detailed design, future discussions with design team and confirmation of levels.



Pollution Hazard Indices				
Land Use Type	**Hazard Level**	**Suspended Solids**	**Metals**	**Hydrocarbons**
Residential roofing	Very Low	0.2	0.2	0.05
Residential Parking	Low	0.5	0.4	0.4
Low traffic roads (<300 traffic movements a day	Low	0.5	0.4	0.4
Pollution Mitigation Indices				
SuDS Component Description		**Suspended Solids**	**Metals**	**Hydrocarbons**
Filter Drain		0.4	0.4	0.5
Porous Paving		0.7	0.6	0.7

Simple Index Approach

NOTES

DO NOT SCALE DRAWINGS, WORK TO FIGURED DIMENSIONS ONLY.

ALL DIMENSIONS AND SIZES TO BE VERIFIED ON SITE.

THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, SCHEDULES AND DETAILS IN THE SERIES.

Legend:

- Approximate application site Planning boundary
- Proposed private foul water pipework
- Proposed private foul water inspection chamber
- Proposed private foul water manhole
- Proposed Rodding Eye
- Proposed private surface water pipework
- Proposed private surface water Catchpit
- Proposed private surface water inspection chamber
- Proposed Permeable Driveway with cellular tank underneath

Rev	Description	Dates	Initials	Chkd

Purpose of issue: PLANNING

Client: THE RICHMOND FELLOWSHIP

Project: NEW BUILD
GREYSTONE RD, ALFORD
ABERDEENSHIRE

Drawing Title: PROPOSED DRAINAGE STRATEGY

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Scale	Sheet Size	Date
1:100	A1	29.01.24

Designed	Drawn	Checked	Approved
CVB	CVB	.	.

Drawing no.: 13248_101

Revision: -