PUNCH
consulting engineers

Tack Site, Sandyford SHD

Stage 1 Storm Water Audit
221140-PUNCH-XX-XX-RP-C-0001

March 2022

Document Control

Document Number: **221140-PUNCH-XX-XX-RP-C-0001**

Status	Revision	Description	Date	Prepared	Checked	Approved
S0	P01	DRAFT	28/03/2022	J. Martin	D. Gallery	L. Brennan
S0	C01	Audit Completion	06/04/2022	J. Martin	D. Gallery	L. Brennan

Report by: **Joshua Martin** Date: 6th April 2022
Design Engineer (Meng (Hons MIEI)
PUNCH Consulting Engineers

Checked by: **Donal Gallery** Date: 6th April 2022
Technical Director (BEng (Hons) PGDipHSC MIEI MIOSH)
PUNCH Consulting Engineers

Approved by: **Leonard Brennan** Date: 6th April 2022
Technical Director (BE Dip Hy&Geo Eng PGDipHSC CEng MIEI MIOSH)
PUNCH Consulting Engineers

Table of Contents

1 Introduction

1.1 Purpose of Report

This report presents a Stage 1 Storm Water Audit (SWA) carried out for a proposed Strategic Housing Development (SHD) and associated infrastructure at Sandyford in south County Dublin.

1.2 Site Details

The site is located at the junction of Carmanhall Road and Ravens Rock Road, Sandyford in south County Dublin and is approximately 0.57 hectares. The proposed development will comprise 207 No. Build-to-Rent residential units on the former Tack Packaging site and 1 No. Creche. The site is bordered by existing commercial units. The land generally falls from southwest to northeast ranging in level from 89.0mOD in the southwest to 84.0 mOD in the northeast). The existing ground levels around the site range from 89m – 84mOD. The ground floors of the proposed buildings step across the site to mimic the existing levels as far as reasonably practicable to minimise cut and fill across the site.

1.3 Report Details

The audit was carried out by PUNCH Consulting Engineers between the dates of 22-03-2022 and 28-03-2022.

This Stage 1 Audit has been carried out in accordance with the Dún Laoghaire-Rathdown County Council (DLRCC) Stormwater Audit Procedure Rev 0 January 2012. The auditor has examined only those issues within the design relating to storm water drainage implications of the scheme and has therefore not examined or verified the compliance of the design to any other criteria.

- Appendix A contains copies of drawings and documents examined by the auditor.
- Appendix B contains the documents and drawings received to accompany the feedback from.
- Appendix C contains the Storm Water Audit Feedback form

All of the findings outlined in Section 2 of this report are considered by the auditor to require action in order to improve the stormwater credentials of the scheme.

1.4 Documents Reviewed

The below documents were reviewed as part of this SWA and are included in Appendix A

1. 21-118-P100 - Site Location Plan
2. 21-118-P120 - Proposed Surface Water Drainage Layout
3. 21-118-P124 - Proposed Foul & Surface Water Drainage Layout
4. 21-118-P125 - SUDS Measures
5. 21-118-P126 - SUDS Details
6. 21-118-P131 - Public Surface Water Drainage Details
7. 21-118-P132 - Private Surface Water Drainage Details
8. 21-118-P136 - Hydrobrake & Petrol Interceptor Details
9. 21-118-P137 - Proposed Surface Water Attenuation Details
10. 21-118r.069 EAR - Tack_app

1.5 Documents Reviewed

The below documents were reviewed as part of this SWA and are included in Appendix B

1. 21-118-P120 Proposed Surface Water Drainage Layout at B1 Lower Ground Level
2. 21-118-P121 - Proposed Foul Water Drainage Layout at B1 Lower Ground Level
3. 21-118-P122 - Proposed Surface Water Drainage Layout at Podium Leveler Ground Level
4. 21-118-P123 - Proposed Drainage Layout at B2 Basement Level
5. 21-118-P124 - Proposed Foul & Surface Water Drainage Layout at B1 Lower Ground Level
6. 21-118-P125 - SUDS Measures and Overland Flood Route
7. 21-118-P126 - SUDS Details
8. 21-118-P128 - Proposed Foul & Surface Water Drainage Outfalls
9. 21-118-P136 - Hydrobrake & Petrol Interceptor Details
10. 21-118-P137 - Proposed Surface Water Attenuation Details
11. 21-118-P190 - Proposed Buildings Levels
12. 21-118r.061 FRA – Tack
13. 21-118r.069 EAR - Tack_app
14. T-L1-500 - LANDSCAPE PLAN

2 Stage 1 Audit Findings

2.1 Roads, Carparks and Landscaped Areas

2.1.1 Basement / Under Croft Layout

Problem: The extent of the ground, basement and podium floor layouts is unclear.

Recommendation: For clarity please provide clear ground, basement and podium floor layouts.

2.1.2 Under Croft Carpark Drainage

Problem: No proposals for the collection of surface water runoff from the under croft car park area have been shown (drawing P120).

Recommendation: Show proposals for collecting any runoff from the carpark including gullies etc. This should outfall via a petrol interceptor and then outfall to the foul network as per the Greater Dublin Regional Code of Practice.

2.1.3 SuDS Layout Drawing

Problem: The provided SuDS layouts does not clearly show the surface finishes for all areas within the site boundary.

Recommendation: A single drawing should be prepared that shows the surface finishes for all areas within the site including hard/soft landscaping. It should be clear at what level the surfaces are i.e., Ground, podium & roof level. SuDS to be considered which include filter drains, swales, bio-retention systems, tree pit systems, pervious pavements, etc. Details of the SuDS measures to also be provided.

2.1.4 Sump Manholes

Problem: Silt entering the system including the petrol interceptor and attenuation tank has the potential to cause blockages.

Recommendation: Consider utilisation of sump manholes upstream of the Petrol interceptor and attenuation tank to capture any excess silt therefore preventing entry into the tanked systems.

2.1.5 Draining of Permeable Surfaces

Problem: It is unclear how the permeable surfaces will discharge to the drainage network.

Recommendation: Please show how permeable surfaces will discharge to the drainage network.

2.1.6 Hydrobrake

Problem: The proposed Hydrobrake has an outflow of 0.9l/s. The orifice arising from an outflow of 0.9l/s will be too small and result in maintenance issues.

Recommendation: Consider increasing the discharge rate, this will require discussion and agreement with Dun Laoghaire Rathdown County Council. A minimum Hydrobrake orifice of 50 mm is recommended.

2.1.7 Utility Clash Check

Problem: It is unclear if a utility clash check has been carried out. Particularly where the proposed foul and surface water cross and connect to the existing network.

Recommendation: Confirm if a clash check has been carried out. Other services should also be considered when carrying out the check.

2.1.8 Blockages

Problem: There is potential for blockages within attenuation and drainage infrastructure.

Recommendation: Carry out a design check on flow routes where storm water cannot enter the drainage network due to blockages downstream. This check is also appropriate for exceedance flows. Provide a site layout illustrating the overland flow routes.

2.2 Buildings/Residential Units

2.2.1 Green Roof Co-ordination

Problem: It is unclear if the greenroof layout has been co-ordinated with M&E plant and access points to roof level.

Recommendation: Confirm co-ordination has been carried out.

2.2.2 Rainwater Harvesting Tanks

Problem: There is potential to install rainwater harvesting facilities for the proposed units where greenroofs have not been shown. The rainwater collected can be used for toilet flushing within the new units and irrigation of the landscaping.

Recommendation: Consider incorporating rainwater harvesting tanks.

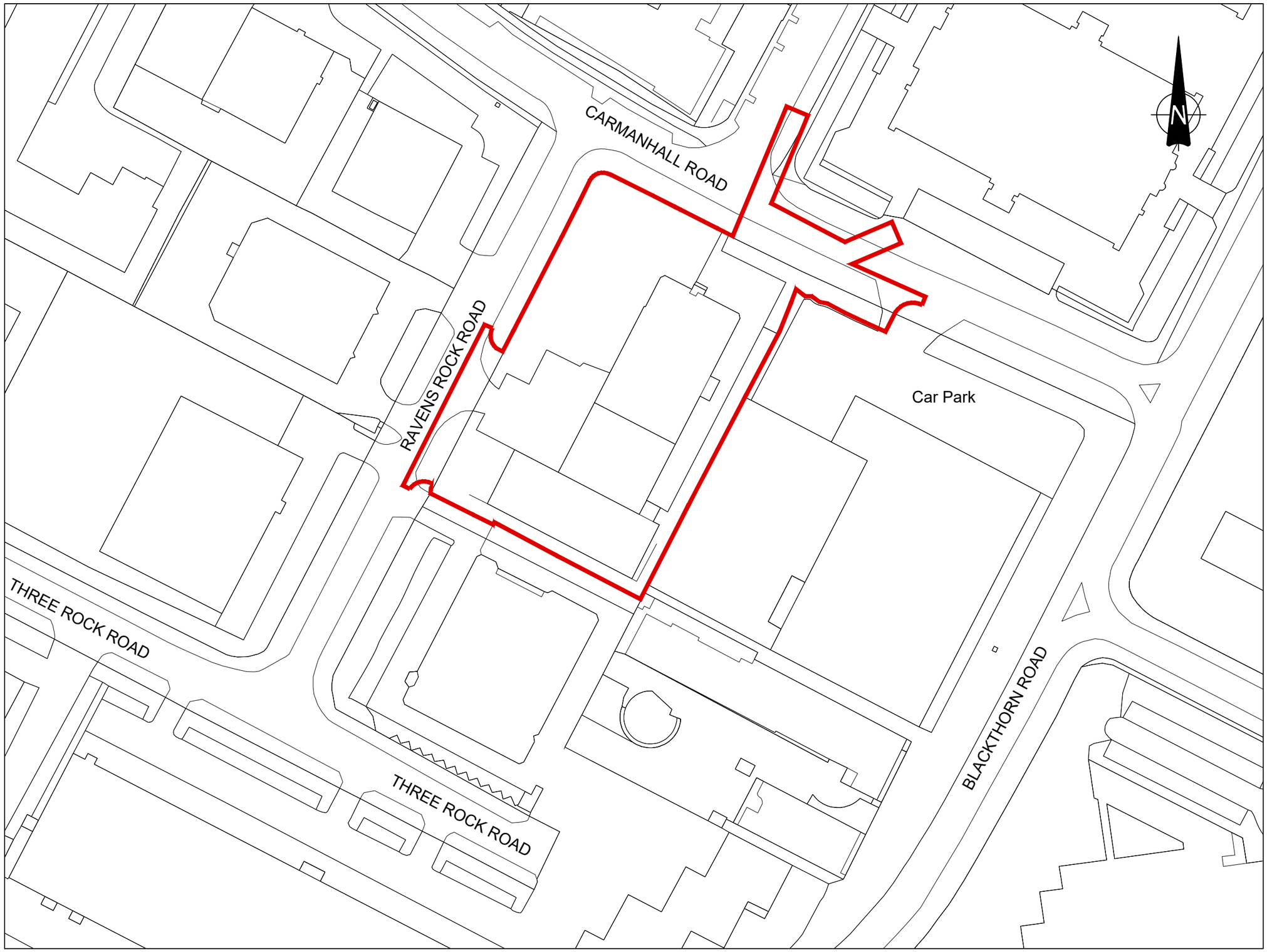
Appendix A Drawings and Documents Examined by the Auditor

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

INDICATES EXTENT OF PROPOSED PLANNING PERMISSION BOUNDARY (AVID SITE)



PLAN VIEW - SITE LOCATION PLAN

1:1000 0 20.0 40.0 60.0 80.0 100.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

14 March 2022 12:03

-- DRAFT --

Graham Byrne

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

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CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD AND ATLAS GP LTD.

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD LRD

TITLE SITE LOCATION PLAN

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:1000 @A3	21-118	P100	

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND SURFACE WATER

SW MH3
CL 84.250
IL 81.128
225mmØ @ 1:200.0 → INDICATES PROPOSED SURFACE WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

SWDP — PROPOSED 150mmø SURFACE WATER DOWN PIPE (BY OTHERS)

Ex. SW
CL: 84.25
IL: 81.00
EX 450ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

INDICATES FUTURE FOOTPATH

INDICATES FUTURE CYCLETRACK

INDICATES FUTURE ROAD

INDICATES FUTURE GRASS VERGE

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

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ARCHITECT	MC CAULEY DAYE O'CONNELL
PROJECT	TACK SANDYFORD LRD
TITLE	PROPOSED SURFACE WATER DRAINAGE LAYOUT

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P120	

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

LEGEND FOUL AND SURFACE WATER

- INDICATES PROPOSED PUBLIC FOUL WATER SEWER AND MANHOLE.
- INDICATES PROPOSED PRIVATE FOUL WATER SEWER AND MANHOLE
- Ex. FW CL: 83.79 IL: 81.90
- EX 225ø FOUL → FOUL — INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES PROPOSED SURFACE WATER SEWER AND MANHOLE
- Ex. SW CL: 84.25 IL: 81.00
- EX 450ø SV → SV — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES FUTURE FOOTPATH
- INDICATES FUTURE CYCLETRACK
- INDICATES FUTURE ROAD
- INDICATES FUTURE GRASS VERGE

REV.	DATE	AMENDMENT	DRN	APPD

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ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT
TACK SANDYFORD LRD

TITLE
PROPOSED FOUL & SURFACE WATER DRAINAGE LAYOUT

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
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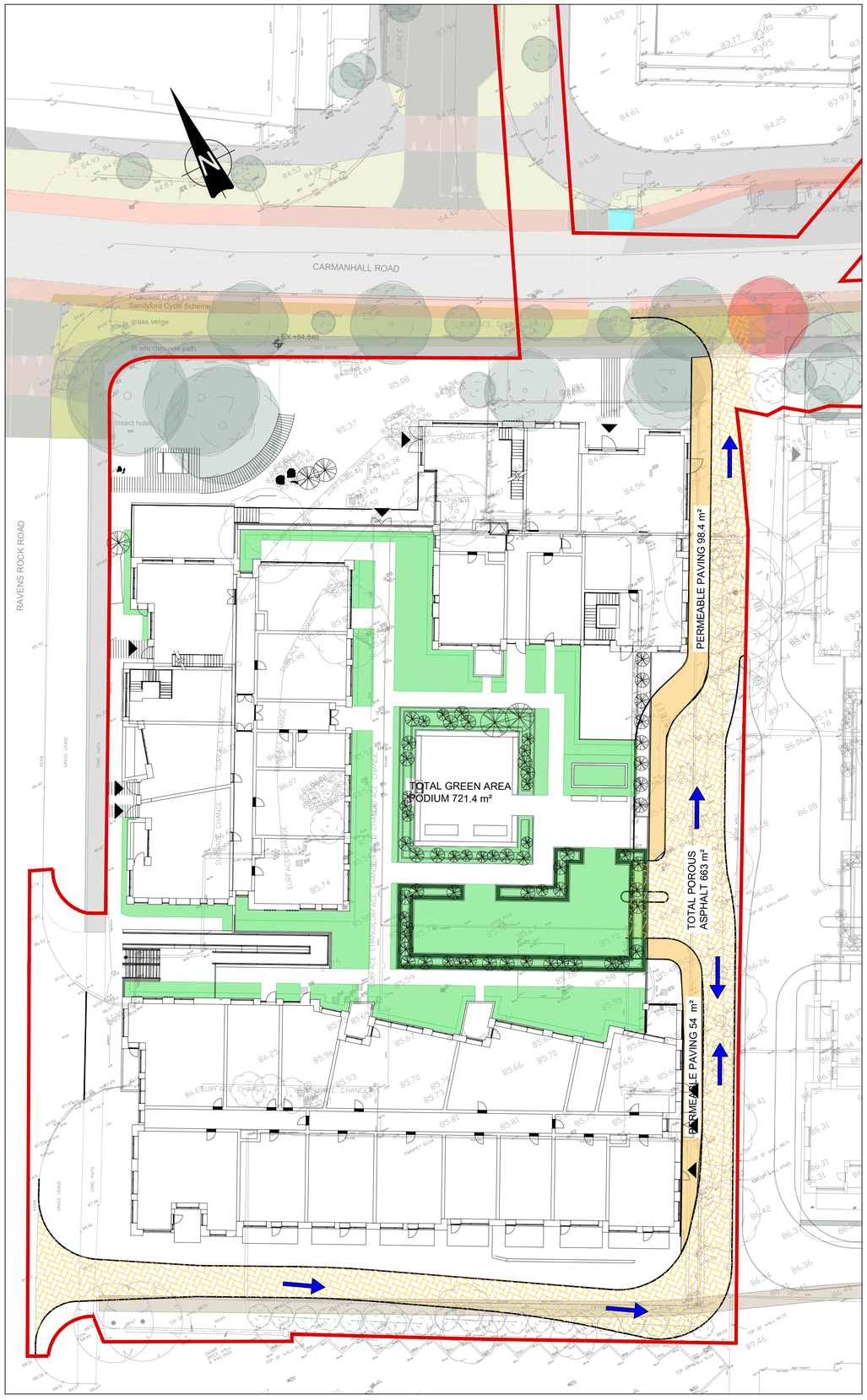
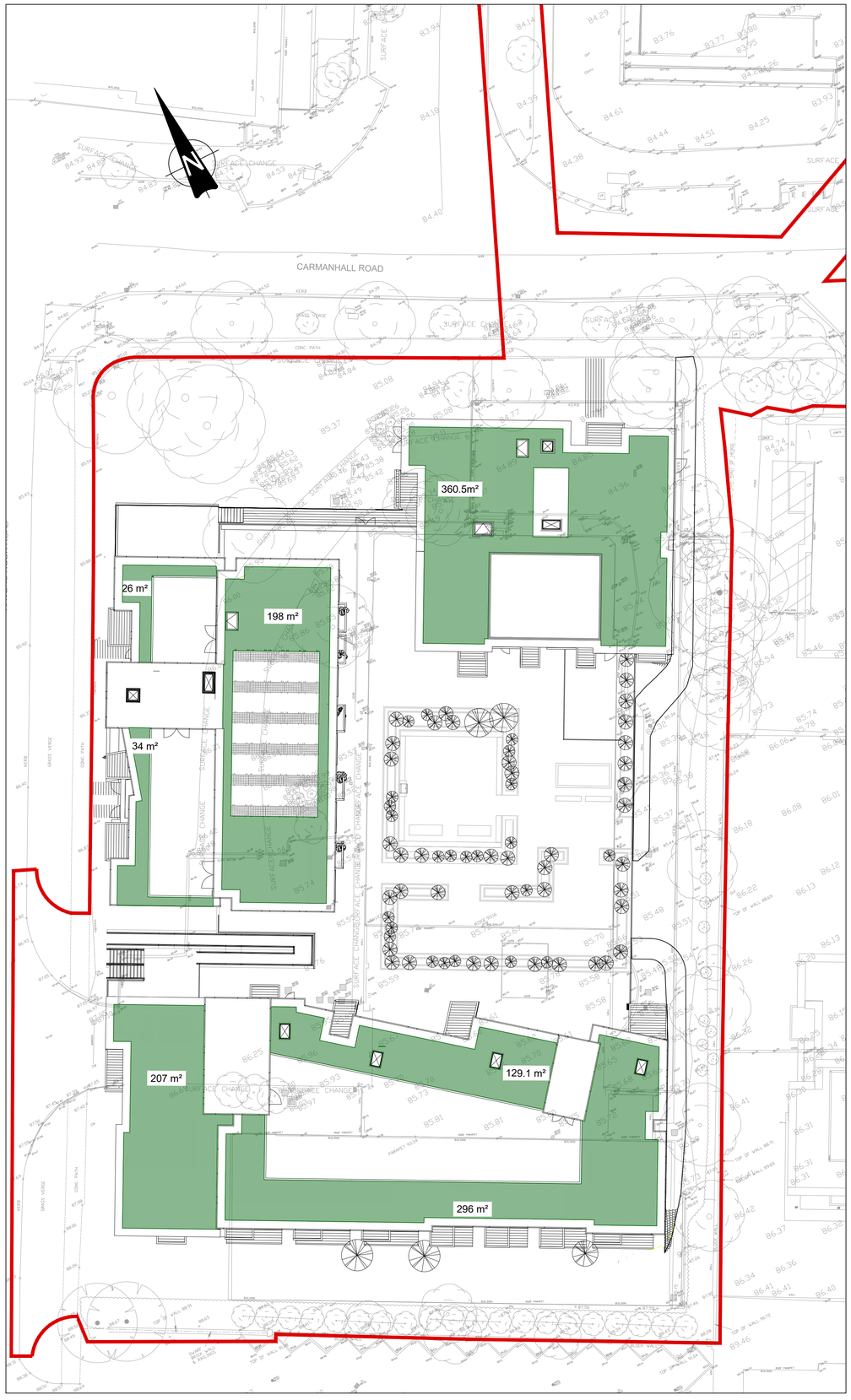
14 March 2022 12:29 -- DRAFT -- Graham Byrne

Ex. FW CL: 84.10 IL: 81.23
Ex. SW CL: 84.25 IL: 81.00
Ex. FW CL: 83.92 IL: 82.01
Ex. FW CL: 83.79 IL: 81.90
Ex. SW CL: 85.06 IL: 81.57
Ex. SW CL: 87.22 IL: 84.39
Ex. FW CL: 81.80 IL: 79.32

EX 225ø
EX 300ø
EX 450ø
FWDP
SWDP
CARMANHALL ROAD
RAVENS ROCK ROAD
SURFACE WATER ATTENUATION
TAXI SET DOWN
PEDESTRIAN LINK BRIDGE
STOP
existing footpath
POSSIBLE FUTURE ROAD CONNECTION
FFL 85.00
FFL 86.615
1:10 SLOPE



PLAN VIEW – PROPOSED SUDS MEASURES AT PODIUM LEVEL



PLAN VIEW – PROPOSED SUDS MEASURES AT ROOF LEVEL

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
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SUDS LEGEND : ROOF

- INDICATES PROPOSED GREEN ROOF
- 198 m² — INDICATES AREA OF GREEN ROOF / CONTRIBUTING TO INTERCEPTION STORAGE
- INDICATES PLANNING APPLICATION BOUNDARY

SUDS LEGEND: PODIUM

- INDICATES PROPOSED PODIUM GREEN ROOF
- 721.4 m² — INDICATES AREA OF GREEN ROOF / CONTRIBUTING TO INTERCEPTION STORAGE
- INDICATES PROPOSED POROUS ASPHALT
- INDICATES OVERLAND DRAINAGE FLOW ROUTES
- INDICATES PLANNING APPLICATION BOUNDARY
- INDICATES PROPOSED PERMEABLE PAVING

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

14 March 2022 12:30
- - DRAFT - -
Graham Byrne

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PROJECT TACK SANDYFORD LRD
TITLE SUDS MEASURES

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P125	

NOTES:

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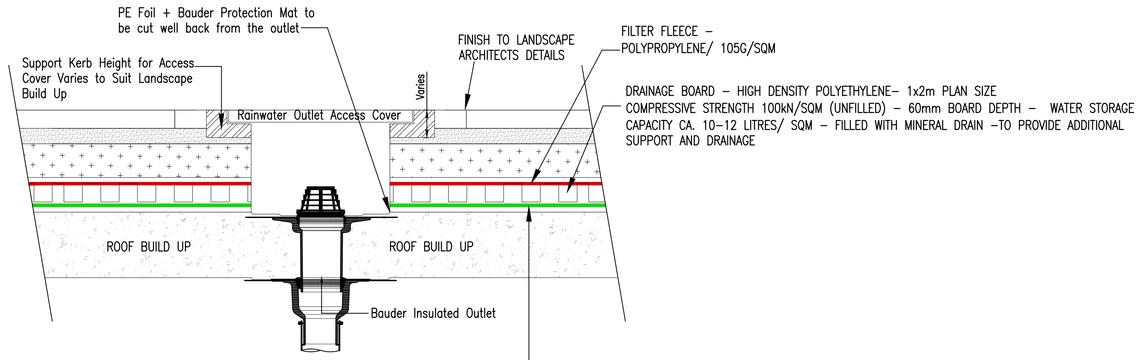
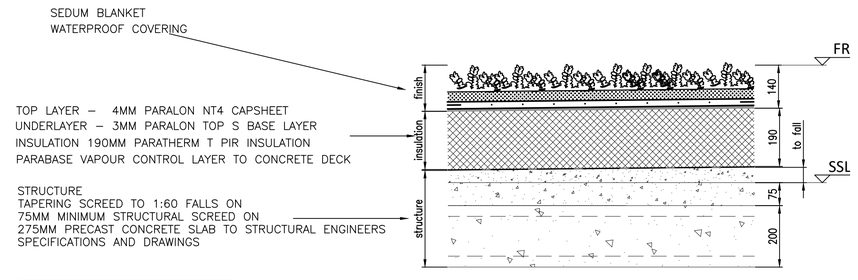
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



TYPICAL OUTLET ON PODIUM

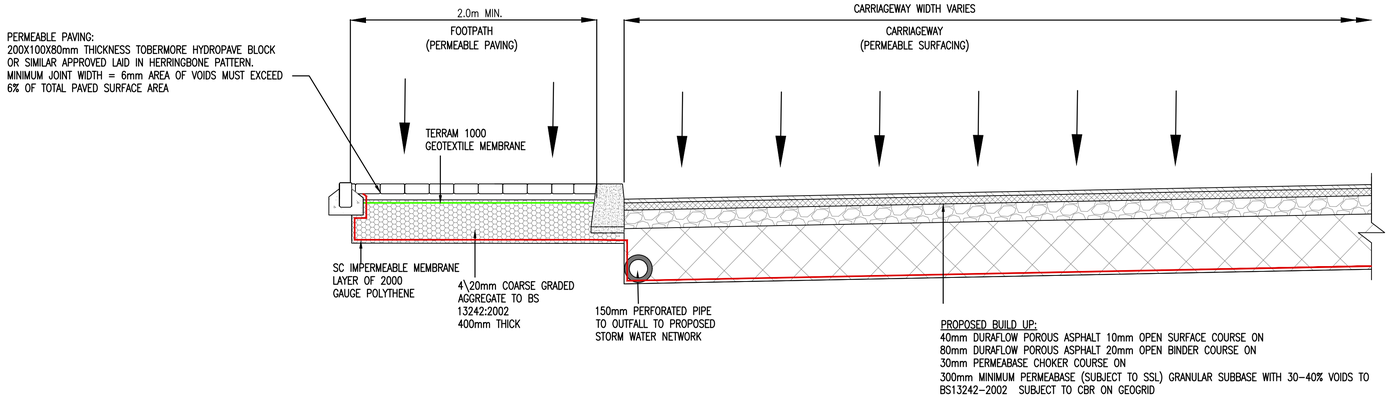
SCALE 1:10 @A1



U–VALUE TO BE ACHIEVED 0.12 W/m²K

TYPICAL SECTION THROUGH GREEN ROOF

SCALE 1:10



CROSS SECTION THROUGH PERMEABLE SURFACING

SCALE 1:25

14 March 2022 11:54
-- DRAFT --
Graham Byrne

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1:1 0 10 20 30 40 50 60 70 80 90 100m

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100m

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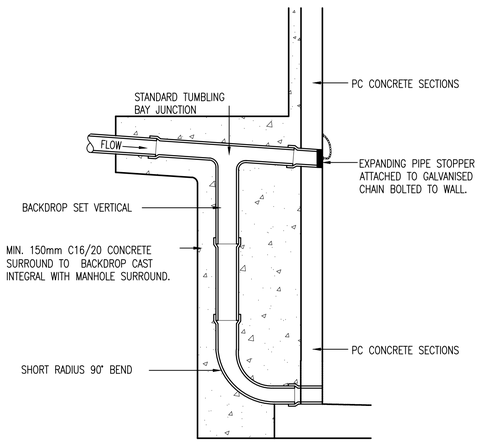
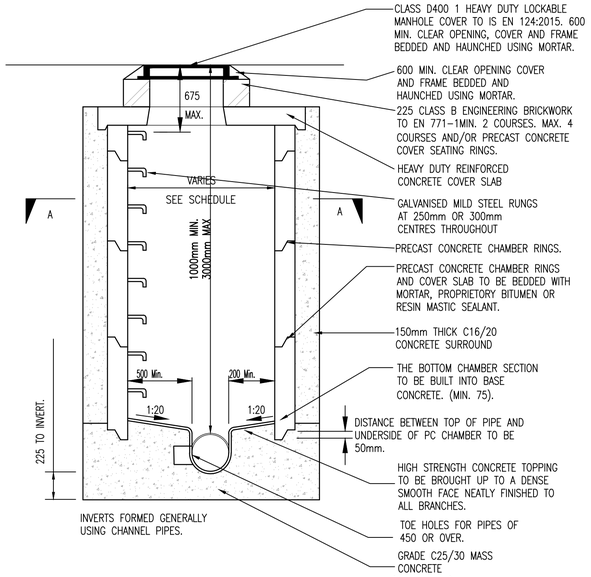
TITLE	SUDS DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	21–118	P126	



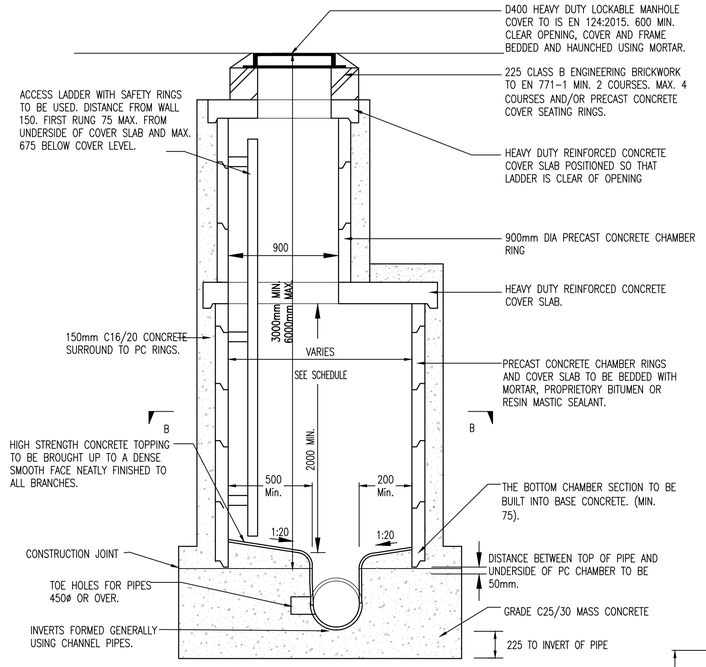
TYPICAL BACKDROP DETAIL

INLET DIA. (mm)	DROP DIA. (mm)
225	300
300	375
375	375
450	450
525	450
600	450
750	600
900	600



PRECAST CONCRETE RING MANHOLE DETAIL TYPE J (GDSDS)

SCALE 1:25

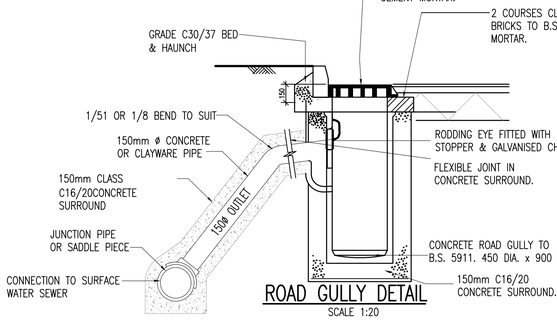


PRECAST CONCRETE RING MANHOLE TYPE K

SCALE 1:25

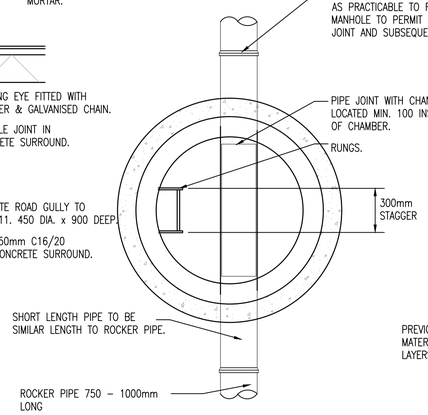
NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. TYPE A GRANULAR FILL SHALL CONSIST OF WASHED PEA GRAVEL. ALL MATERIAL SHALL PASS A 19mm B.S. SIEVE TEST AND SHALL BE RETAINED BY A 4.75mm B.S. SIEVE TEST.
4. SELECTED FILL SHALL BE FREE FROM STONES GREATER THAN 25mm IN SIZE, BUILDERS RUBBLE VEGETABLE MATTER AND LUMPS OF CLAY GREATER THAN 75mm IN SIZE AND SHALL BE COMPACTED IN 150mm LAYERS.
5. IN OPEN SPACES BACKFILL SHALL CONSIST OF SUITABLE SELECTED EXCAVATED MATERIAL. UNDER PAVED AREAS BACKFILL SHALL CONSIST OF SUITABLE APPROVED GRANULAR FILL. GENERAL BACKFILL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 300mm THICK.
6. CONCRETE BED AND SURROUND SHALL BE USED ON ALL PIPES WHERE COVER TO THE SOFFIT OF THE PIPE IS LESS THAN 1.2m IN ROADS, FOOTPATHS AND GRASS MARGINS AND 0.9m IN OPEN SPACES AND FIELDS.
7. ALL CONCRETE FOR PIPE BEDDING, HAUNCHING AND SURROUNDS SHALL BE GRADE 20N/20.
8. ALL MANHOLES SHALL BE WATERTIGHT TO THE SATISFACTION OF THE ENGINEER.
9. FORMWORK TO REINFORCED CONCRETE AND MASS CONCRETE SHALL BE CLASS F2.
10. CLASS U2 FINISH TO THE TOP OF SLABS. REINFORCEMENT TO SLABS TO ENGINEERS DETAILS.
11. 200mm THICK CL. 30/20 MASS CONCRETE FOUNDATIONS. 225 THICK PRECAST R.C. ROOF SLAB IN CL 30/20 CONCRETE. COVER TO STEEL TO BE 40mm.
12. TOE HOLES TO BE PROVIDED IN BENCHING OF SEWERS GREATER THAN 450mm DIAMETER FOR ACCESS TO INVERT. SAFETY CHAIN ON SEWERS 600mm. DIAM. OR GREATER MILD STEEL SAFETY CHAIN SHALL BE 10MM. NOMINAL SIZE GRADE M(H) NON CALIBRATED CHAIN, TYPE 1, COMPLYING WITH BS4942 PART 2.
13. WHEN DEPTH OF MANHOLES TO INVERT IS GREATER THAN 3.5m, LADDERS SHALL BE USED INSTEAD OF RUNGS. FIXED LADDERS SHOULD MEET THE DIMENSIONAL REQUIREMENTS OF BS4211 EXCEPT THAT STRINGERS SHOULD NOT BE LESS THAN 65 X 20mm IN SECTION AND RUNGS 25mm IN DIAMETER.
14. LADDER STRINGERS SHOULD BE ADEQUATELY SUPPORTED FROM THE MANHOLE WALL AT INTERVALS OF NOT MORE THAN 3.0m STRINGERS SHOULD BE BOLTED TO CLEATS TO FACILITATE RENEWAL.
15. ALL LADDERS, RUNGS, HANDRAILS, SAFETY CHAIN, ETC. SHALL BE HOT DIPPED GALVANISED TO BS729.
16. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF LOCAL COUNTY COUNCIL.



ROAD GULLY DETAIL

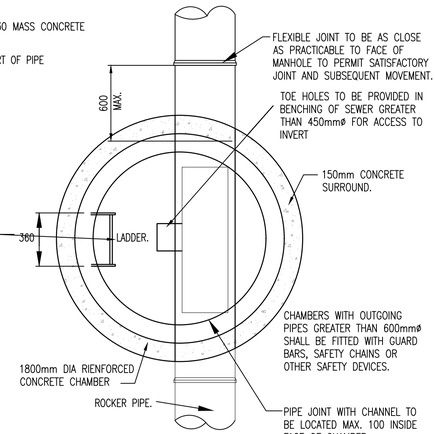
SCALE 1:20



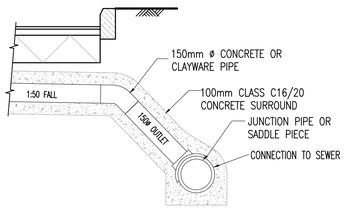
SECTION A–A

PIPE DIAMETER	ROCKER PIPE LENGTH
150 – 450	0.5 – 0.75
451 – 750	0.75 – 1.0
750 >	SEEK GUIDANCE

DIAMETER OF LARGEST PIPE IN MANHOLE	PRECAST CONCRETE RING SIZE
LESS THAN 375mm	1200mm DIA
375mm TO 450mm	1350mm DIA
500mm TO 700mm	1500mm DIA
750mm TO 900mm	1800mm DIA
950mm TO 1200mm	2100mm DIA
1250mm AND ABOVE	2400mm DIA



SECTION B–B

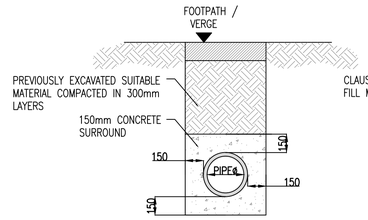


TYPICAL SADDLE CONNECTION

SCALE 1:25 @ A1

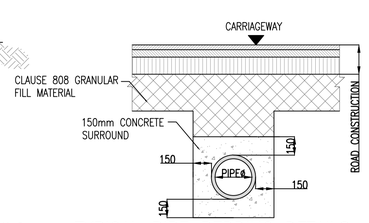
NORMAL INTERNAL DIAMETER	MINIMUM TRENCH WIDTH mm	MAXIMUM TRENCH WIDTH mm
100	450	650
150	500	700
225	600	800
300	700	900
375	950	1150
450	1050	1250
525	1150	1350
600	1250	1450
675	1350	1550
750	1400	1600
825	1500	1700
900	1950	2150
1050	2100	2300
1200	2300	2500
ABOVE 1200	PIPE DIAMETER PLUS 800mm	OUTSIDE DIAMETER PLUS 1000mm

MAXIMUM AND MINIMUM TRENCH WIDTHS



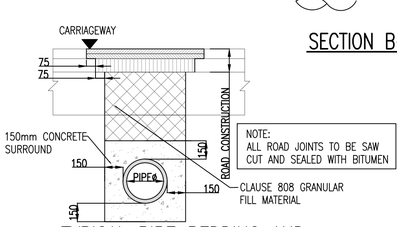
TYPICAL PIPE BEDDING DETAILS NON TRAFFICKED AREAS LESS THAN 900mm TO PIPE CROWN

SCALE 1:25



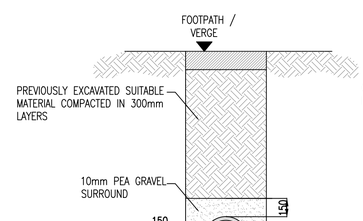
TYPICAL PIPE BEDDING DETAILS TRAFFICKED AREAS LESS THAN 1200mm TO PIPE CROWN

SCALE 1:25



TYPICAL PIPE BEDDING AND REINSTATEMENT DETAILS TRAFFICKED AREAS (ROADWAY) LESS THAN 1200mm TO PIPE CROWN

SCALE 1:25



TYPICAL PIPE BEDDING DETAILS NON TRAFFICKED AREAS GREATER THAN 900mm TO PIPE CROWN

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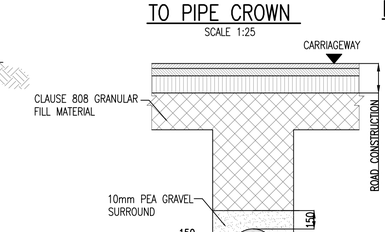

TYPICAL PIPE BEDDING DETAILS TRAFFICKED AREAS GREATER THAN 1200mm TO PIPE CROWN

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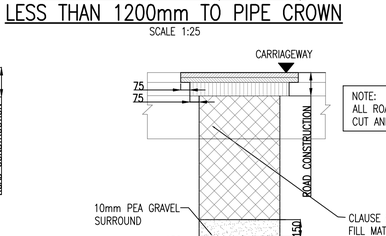

TYPICAL PIPE BEDDING AND REINSTATEMENT DETAILS TRAFFICKED AREAS (ROADWAY) GREATER THAN 1200mm TO PIPE CROWN

SCALE 1:25

14 March 2022 12:31

- - DRAFT - -

Graham Byrne

1:25 0 0.5 1.0 1.5 2.0 2.5m

1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

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ARCHITECT	MC CAULEY DAYE O'CONNELL
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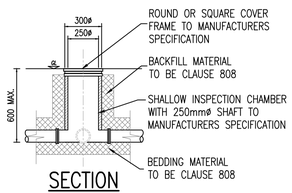
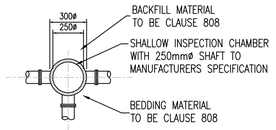
TITLE	PUBLIC SURFACE WATER DRAINAGE DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:25 @A1	21-118	P131	



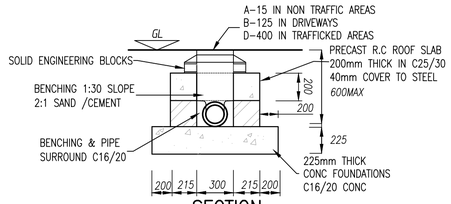
SECTION



PLAN

CIRCULAR INSPECTION CHAMBER WHERE INVERT IS 0.6m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9

SCALE 1:25



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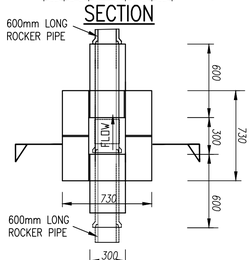
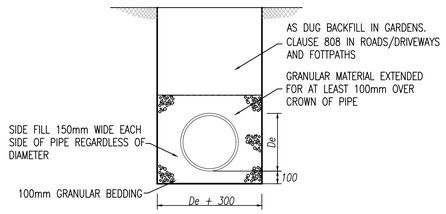


PLAN

INSPECTION CHAMBER WHERE INVERT IS 0.6m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9

SCALE 1:25

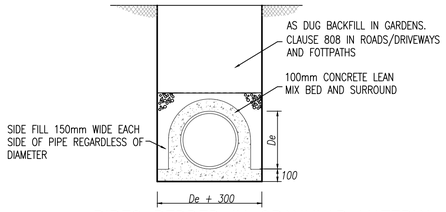


PIPES BEDDED IN GRANULAR MATERIAL

COVER > 0.9m IN ROADS

COVER > 0.6m IN GARDENS

SCALE 1:25

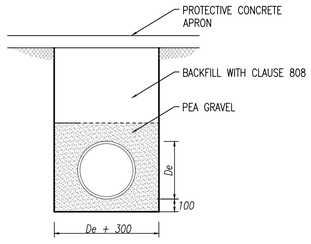


PIPES BEDDED IN GRANULAR MATERIAL

COVER < 0.9m IN ROADS

COVER < 0.6m IN GARDENS

SCALE 1:25

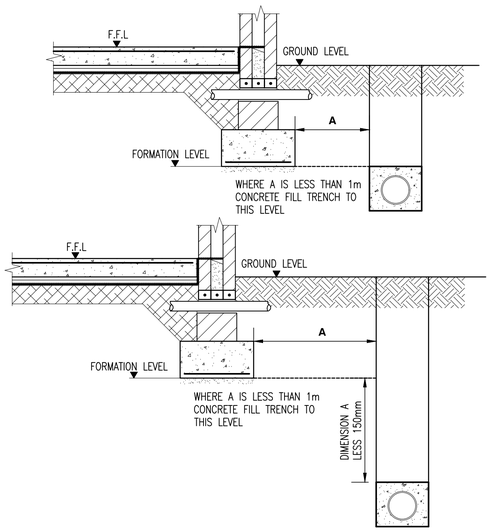


PIPES BEDDING ALTERNATIVE DETAIL

COVER < 0.9m IN ROADS

COVER < 0.6m IN GARDENS

SCALE 1:25

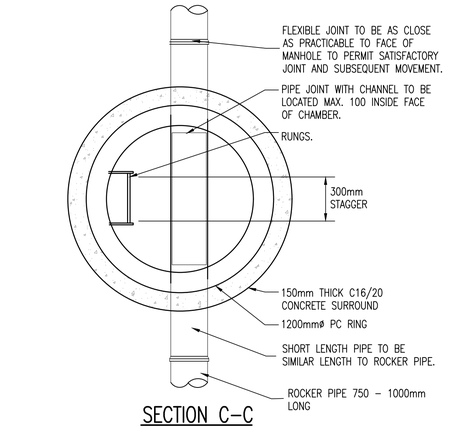


TYPICAL DETAIL WHERE PIPE RUNS NEAR BUILDINGS

SCALE 1:25

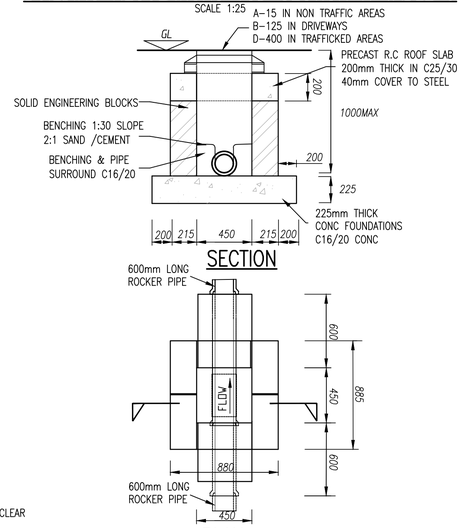
NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE BUILDING REGULATIONS 2010 SECTION H "DRAINAGE AND WASTE WATER DISPOSAL" AND WITH LOCAL AUTHORITY REQUIREMENTS
4. ANY ALTERNATIVE DETAILS PROPOSED BY THE CONTARCTOR SHALL BE SUBMITTED TO THE ENGINEER AT LEAST 2 WEEKS PRIOR TO THE CONSTRUCTION OF THE DRAIN
5. MINIMUM SPACING OF ACCESS POINTS TO BE IN ACCORDANCE WITH BUILDING REQULATIONS TECHNICAL GUIDANCE DOCUMENT SECTION 4 TABLE 10
6. DETAILS OF MATERIALS FOR CONSTRUCTION REFER TO BUILDING BUILDING REQULATIONS TECHNICAL GUIDANCE DOCUMENT SECTION 4 TABLE 11
7. BACKFILL OF ALL INSPECTION CHAMBERS TO BE 808 BACKFILL IN 200mm LAYERS
8. INSTALLATION OF PLASTIC PIPES AND FITTINGS, GULLIES, AJ'S ETC TO BE STRICTLY IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS



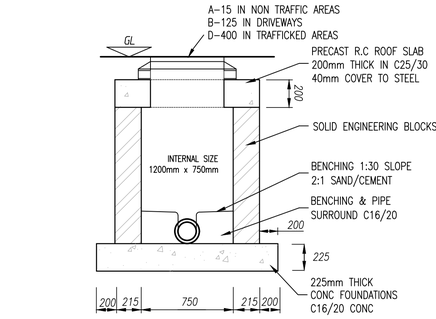
SECTION C–C

SCALE 1:25

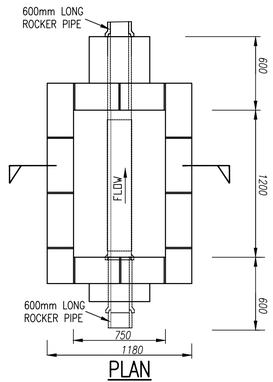


PLAN

INSPECTION CHAMBER WHERE INVERT IS 1m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9



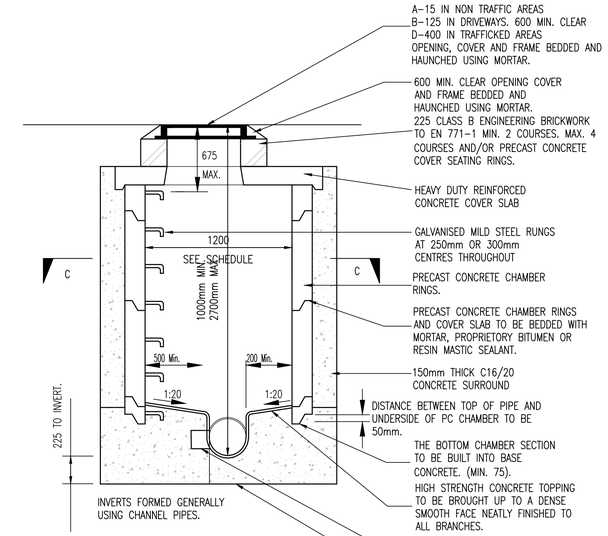
SECTION



PLAN

INSPECTION CHAMBER DEPTH TO INVERT IS BETWEEN 1m AND 2.7m BUILDING REGULATIONS TGD SECTION H TABLE 9

SCALE 1:25



CIRCULAR INSPECTION CHAMBER WHERE INVERT IS BETWEEN 1m AND 2.7m BUILDING REGULATIONS TGD SECTION H TABLE 9

SCALE 1:25

TABLE 9 Minimum dimensions for access fitting and chambers

Type	Depth to (m)	Internal Sizes		Cover Sizes	
		length x width (mm x mm)	Circular (mm)	length x width (mm x mm)	Circular (mm)
Rodding eye					
Access Fitting					
small	0.6 or less	150 x 100	150	150 x 100	150
large		300 x 100	-	300 x 100	-
Inspection Chamber	0.6 or less	300 x 300	190*	300 x 300	190*
	1.0 or less	450 x 450	450	450 x 450	450**
Manhole	1.5 or less	1200 x 750	1000	600 x 600	600
	over 1.5	1200 x 750	1200	600 x 600	600
	over 2.7	1200 x 840	1200	600 x 600	600
Shaft	over 2.7	900 x 840	900	600 x 600	600

Note:

* For clayware or plastics may be reduced to 430mm in order to provide support for cover and frame

** Drains up to 150mm

14 March 2022 12:31

- - DRAFT - -

Graham Byrne

1:25 0 0.5 1.0 1.5 2.0 2.5m

1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

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CLIENT	SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD AND ATLAS GP LTD.
ARCHITECT	MC CAULEY DAYE O'CONNELL
PROJECT	TACK SANDYFORD LRD
TITLE	PRIVATE SURFACE WATER DRAINAGE DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:25 @A1	21-118	P132	

Outlet Size 'B'	Inlet Size 'A'	Fall across unit	Approx Empty Weight (kgs)	Dim L (mm)	Nominal Flow	Unit Ref No
Ø300 mm	Ø300 mm	100	180	1700	3 L/s	NSBP003

Notes:–

1. Inlet/Outlet pipes are plain pipe standard EN 858 states minimum connection sizes, units ordered with different sized connections are not fully compliant with the standard.

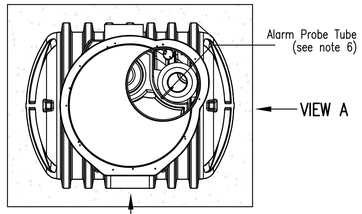
2. Extension necks for deeper inverts can be provided. These can be cut in 200 mm sections. Max 2.0m Invert recommended. Please ask our sales department for further details.

3. All units require appropriate cover and frame to suit applied loadings.

4. This drawing should be used for dimensional information only.It is essential that this drawing is read in conjunction with the installation guidelines from the supplier. 76 mm tube (internal) is supplied to house an oil alarm probe.

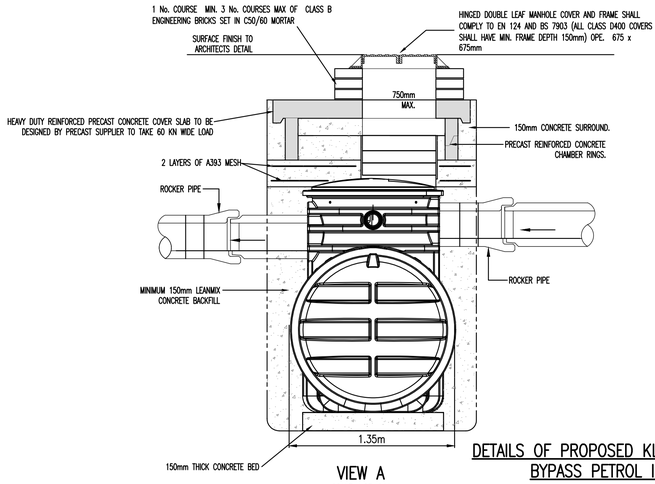
5. Wet site conditions – Concrete Backfill Dry site conditions – Pea Shingle Backfill

6. A ø 76 mm tube (internal) is supplied to house an oil alarm probe.



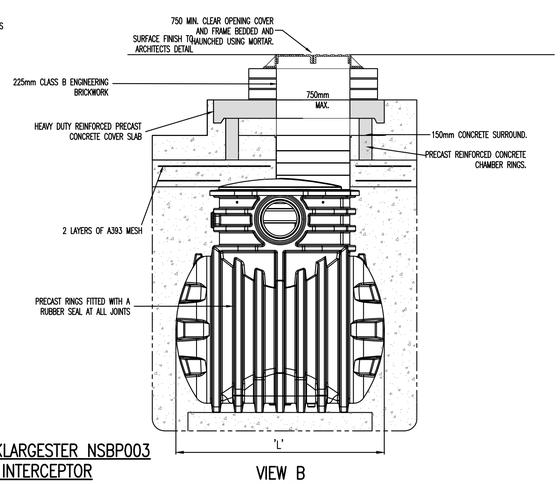
VIEW B

PLAN VIEW
SCALE 1:25 @A1

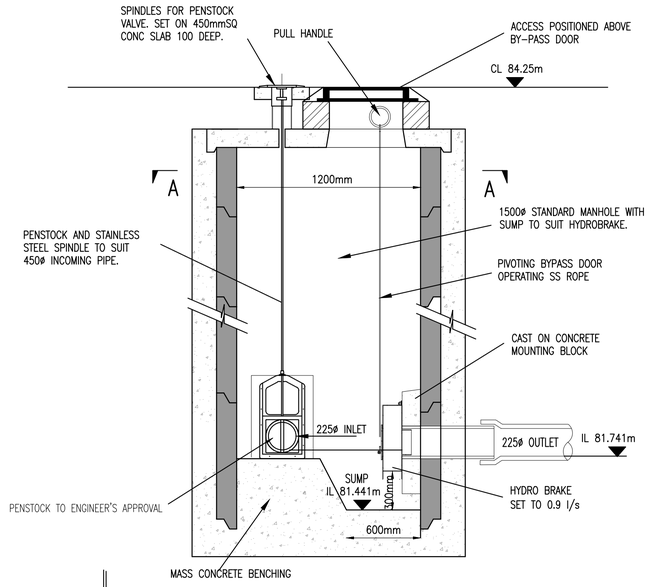


VIEW A
SCALE 1:25 @A1

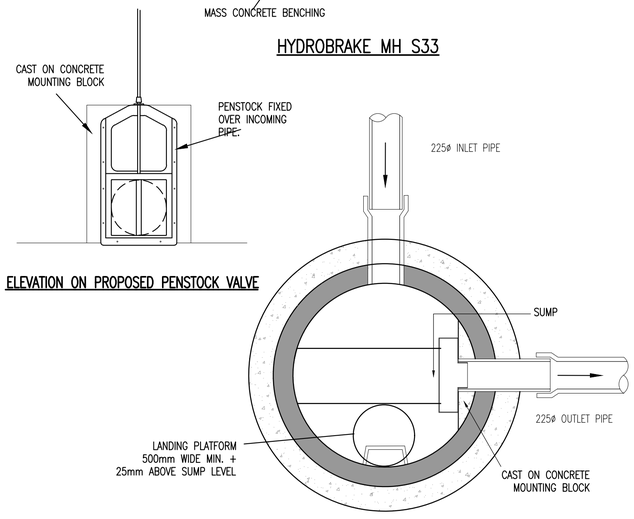
DETAILS OF PROPOSED KLARGESTER NSBP003 BYPASS PETROL INTERCEPTOR



VIEW B
SCALE 1:25 @A1

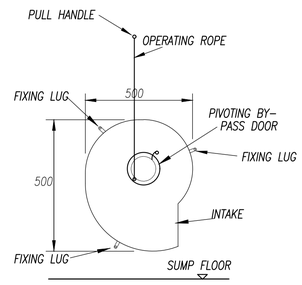


HYDROBRAKE MH S33



ELEVATION ON PROPOSED PENSTOCK VALVE

SECTION A – A



HYDRO BRAKE DETAIL
N.T.S

14 March 2022 09:59 - - DRAFT - - Graham Byrne

1:25 0 0.5 1.0 1.5 2.0 2.5m

1:1 0 10 20 30 40 50 60 70 80 90 100

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ARCHITECT **MC CAULEY DAYE O'CONNELL**

PROJECT **TACK SANDYFORD LRD**

TITLE **HYDROBRAKE AND PETROL INTERCEPTOR DETAILS**

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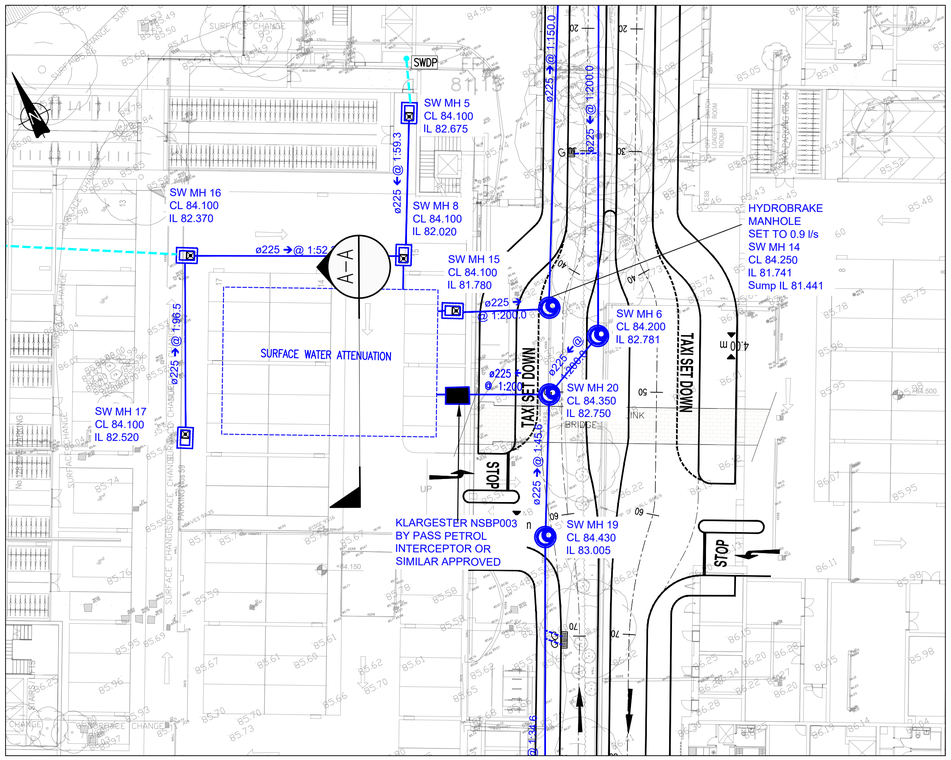
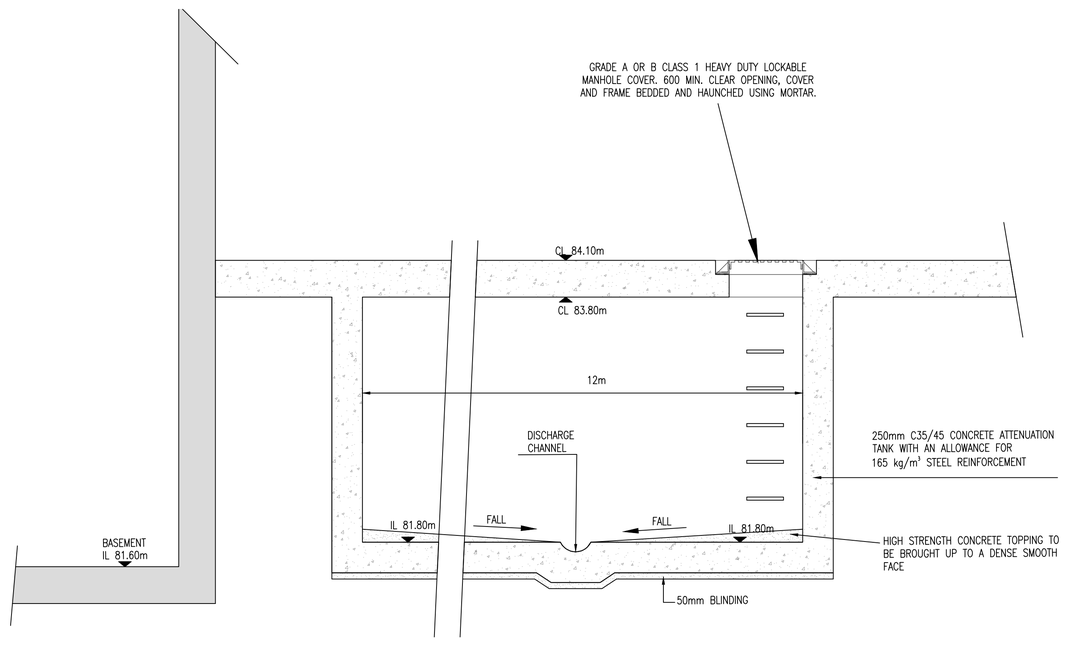


PLAN VIEW – SURFACE WATER ATTENUATION LAYOUT

SCALE 1:500 @A1



SECTION A–A
ATTENUATION TANK CROSS–SECTION

SCALE 1:25 @A1

14 March 2022 10:53
-- DRAFT --
Graham Byrne

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LEGEND SURFACE WATER

SW MH3
CL 84.250
IL 81.128

225mmØ @ 1:200.0 → INDICATES PROPOSED SURFACE WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

SWDP — PROPOSED 150mmø SURFACE WATER DOWN PIPE (BY OTHERS)

Ex. SW
CL: 84.25
IL: 81.00

EX 450ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

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ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD LRD

TITLE PROPOSED SURFACE WATER ATTENUATION DETAILS

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SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P137	

Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Tack Sandyford SHD

March 2022

Waterman Moylan Consulting Engineers Limited
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin 3
www.watermangroup.com

Waterman Moylan
Engineering Consultants

Client Name: Sandyford Environmental Construction Ltd.
Document Reference: 21-118r.069
Project Number: 21-118

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	Mar 22	S Nahas L.Ruiz		

Comments

Disclaimer

Content

List of Figures

List of Tables

Appendices

1. Introduction

Waterman Moylan have been appointed on behalf of Sandyford Environmental Construction Ltd. to accompany a planning application to An Bord Pleanala (ABP) for a residential development on a brownfield site at the junction of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. It is also proposed to build 1 No. Creche along with resident support facilities/resident services and amenities.

This report describes the criteria used to design the storm water discharge, disposal of foul water, water supply and vehicular access to the developed site.

2. Site Description

2.1 Site Location

The subject site is located at Sandyford in south County Dublin. The site which has an area of 0.57ha is located at the junction of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. It was formerly occupied by Tack Packaging. Refer to Figure 1 below for the location of the proposed development.

Figure 1 Site Location Map (Google Images)

2.2 Site Description

The site comprises the former Tack Packaging site the junction of Carmanhall Road and Ravens Rock Road. The site area is approximately 0.57ha and is currently largely hardstanding. The site falls from

southwest to northeast ranging in level from 89.0mOD in the southwest to 84.0 mOD in the northeast. The existing access to the site is from Ravens Rock Road.

At the time of writing in March 2022, the site was unoccupied save for a number of empty buildings.

The adjoining site to the east at the junction of Carmanhall Road and Blackthorn Road was formerly occupied by Avid Technology.

2.3 Proposed Development

The proposed development will comprise 207 No. Build-to-Rent residential units on the former Tack Packaging site and 1 No. Creche. See Figure 2.

Cycle parking with 250 spaces will be provided at Lower Ground Level. Car parking with a total of 74 car spaces will be provided at Lower Ground and Basement. Access is proposed from Ravens Rock Road and egress to Carmanhall Road. The public realm around the site will incorporate an upgrade of the pedestrian and cycle environment.

The development includes all associated infrastructure to service the development including access junctions, footpaths and cycle paths together with a network of watermains, foul water drains and surface water drains.

A concurrent development with its own Engineering Assessment Report is expected to be developed on the former Avid Technology site to the east. It will comprise 336 Build-to-Rent residential units and 118 car parking spaces at Lower Ground Level and Basement. Access will be from Carmanhall Road and egress onto Blackthorn Road.

Figure 2 Proposed Site Layout

The existing ground levels around the site range from 89 m – 84 m OD. The ground floors of the proposed buildings step across the site to mimic the existing levels as far as reasonably practicable to minimise cut and fill across the site.

3. Foul Water Drainage

3.1 Receiving Environment

There is an existing 225 mm Ø foul sewer located adjacent to the site along Ravens Rock Road and Carmanhall Road. There is also a 225mm Ø foul sewer along Arkle Road to the northeast of the subject site. Details of the adjacent foul sewer are shown in Appendix A – Irish Water Record Maps.

A Pre-Connection Enquiry form was submitted to Irish Water in November 2021 which outlined the proposals for the drainage of wastewater from the development to the northeast of the subject lands. Irish Water responded with the Confirmation of Feasibility (COF) on 25th January 2022, with reference no. CDS21008079, stating that a wastewater connection to the public sewer is feasible without infrastructure upgrade by Irish Water. However, the foul connection to the public sewer has to be made to the Arkle Road 225mm Ø foul sewer. Please refer to Appendix B for the Irish Water Confirmation of Feasibility.

It is proposed to drain the subject site to the existing 225mmØ foul sewer network on Arkle Road the northeast of the subject lands. It is important to note that the Tack Site (subject site under this planning application) will discharge foul water independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites

3.2 Proposed Foul Water Drainage

The proposed development will consist of 207 No. residential units and 1 No. Creche. Based on Irish Waters Code of Practice, the calculation of the peak foul flow from the proposed development can be seen in Tables 1 and 2 below.

Table 1 Calculation of Proposed Foul Water Flow

Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge
Residential Units	207	150	2.7	1.1	92,218.5
Creche	1	50	78 67 pupils 11 staff	1.1	4,290
				Totals	**96,508.5 l/d**

Table 2 Calculation of Proposed Peak Foul Flow

Calculation of Proposed Peak Foul Flow		Units
Dry Weather Flow Residential (DWF)	1.07	l/s
Dry Weather Flow Commercial (DWF)	0.049	l/s
Peak Foul Flow Residential (=6 x DWF)	6.42	l/s
Peak Foul Flow Commercial (=4.5 x DWF)	0.22	l/s
Total Peak Foul Flow	6.64	***l/s***

Waterman Moylan Drawing's 21-118-P122 illustrate the proposed layout for the foul water sewer outfall for the subject site.

3.3 Network Design

Foul Water Drains will be uPVC to Irish Water specification or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will be laid strictly in accordance with Irish Waters code of practice for Wastewater Infrastructure and Irish Water requirements for taking in charge.

All manholes will be constructed in block work, precast or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying planning submission drawing.

4. Surface Water Drainage

4.1 Introduction

The following section deals with surface water drainage design including details of the SuDS measures proposed as part of the development.

There is an existing 300mm diameter surface water sewer along Ravens Rocks Road. West of the site, that discharges into a 450mm diameter surface water sewer along Carmanhall Road, north of the site. Refer to Appendix A for the existing surface water record map.

The existing site currently drains surface water, unrestricted, to the above-mentioned sewers. It is proposed that the development will attenuate the surface water on-site before discharging at the existing greenfield rate.

The existing run-off rate for the existing hardstanding areas on site was estimated for the 1 in 1, 1 in 30 and 1 in 100 year return periods using the modified rational method:

Q = 2.78 x A x I (where A is the total pre-development area being drained in Hectares and I is the rainfall intensity in mm/h as estimated for the 60min storm from Flow using Met Eireann Data)

A = 0.398 ha (current hardstanding as measured from topographical survey)

I – 1 year return period = 11.235 mm/h

30 year return period = 27.335 mm/h

100 year return period = 43.042 mm/h

Table 4-1 Existing Run-off Rates for impermeable areas

Rainfall Event	Existing development run-off (l/sec) – Hardstanding Areas
Q1	2.78 x 0.398 x 11.235 = **12.43**
Q30	2.78 x 0.398 x 27.335 = **30.24**
Q100	2.78 x 0.398 x 43.042 = **47.62**

4.2 Site Characteristics

The following parameters have been used in greenfield run-off rate and attenuation calculations.

Table 2 Surface Water Catchment Details

	Catchment
Site Area (Catchment) - Ha	0.57
Hardstanding – Ha	0.49

SAAR – mm*1	930
SOIL Index*2	0.1
Climate Change	20%

*1 – From Met Éireann data.

*2 – The soil type of Ireland indicated Soil Type 1. Furthermore a Site investigation was carried out in February 2021 on the adjacent AVID site. The results of the site investigation revealed there is no infiltration present on the site. These soil conditions are expected for Soil type 3 and therefore 0.1 is used as Soil Index for this site. Refer to Appendix C for the above-mentioned Site Investigation.

The site investigation also revealed a highwater table is present at the site. The highest groundwater table was recorded as 1.63 - 2.5 m bgl (below ground level), in June 2020, four months after installation of the standpipes.

4.3 Greenfield run-off rates

The Local Authority requirements are that post-development run-off rates are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, using the UK SUDS Website. Based on a total hardstanding of 0.46 Ha, the Greenfield run-off for the site is 0.11 l/s (Qbar). Please refer to Appendix D. The response report from the DLRCC Drainage department to Stage 2 of the SHD planning application states that is allowed to proposed a Qbar based on 2 l/s/ha, should it be the greater value of the site specific calculated Qbar value. Therefore, the proposed design is based on an outflow of 0.9 l/s.

4.4 SuDS Assessment

As per Dun Laoghaire County Council guidelines surface water should be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 6, for New Developments and CIRIA documents. These documents specify that surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the buildings prioritised.

Sustainable Urban Drainage Systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as SUDS. They are typically made up of one or more structures, built to manage surface water run-off. The use of SUDS to control run-off also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

A stormwater management or treatment train approach ensures that run-off quantity and quality is improved. The following objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in stormwater run-off flows that occur as land is urbanised and to help mitigate the impacts of stormwater quality on receiving systems:

1) **Source control:** conveyance and infiltration of run-off; and
2) **Site Control:** reduction in volume and rate of surface run-off, with some additional treatment provided.

The applicant has considered the use of all appropriate SUDS measures as part of the site SUDS strategy, details are outlined in Table 4 below.

Table 3 SuDs Measures

SUDS Stage	SUDS Measure	Measure Outline	Use on Site
Source Control	Permeable Asphalt	Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater run-off to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated. Permeable asphalt is very effective at removing a wide range of pollutants from surface water runoff as they are either retained on the pavement surface or flushed into the granular subbase where they become trapped and are degraded over time.	Permeable asphalt will be utilised for the surface of the main road to provide treatment and storage to rainwater falling on these areas. As described above, the ground conditions are not considered suitable for infiltration and the groundwater table was found at high level. Therefore, the permeable asphalt would be lined with an impermeable geotextile membrane due to the lack of infiltration available on the site and to prevent groundwater ingress. The design will include a perforated pipe to convey surface water to the site wide drainage system.
	Green Roofs/ Green Podium	As well as providing ecological benefits, green roofs contribute the following positive effects to surface water drainage design: • The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network. • Due to the time for water to infiltrate and permeate the	Green Roofs have been considered and incorporated into the development proposals in accordance with Appendix 16 of DLRCC County Development Plan. The locations of the green roofs are illustrated on the accompanying Waterman Moylan 21-118-P125 - SUDS Measures. 60 % of Green Roof as outlined in Section 3.1 of DLRCC Green Roof guidance document will be provided and is indicated on the Architects drawing.

		substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding. • They improve water quality through the filtration of pollutants during the process of water infiltration. This provides treatment in line with CIRIA SuDS Manual management train. Although green roof space can reduce peak flow rates in the small storm events and aid in reducing the volume of run-off from the site, they operate as conventional roofs in higher storm events. Therefore, green roofs cannot be considered in the surface water drainage run-off calculations for the development. As stated in CIRIA C697 *"although green roofs absorb most of the rainfall that they receive during ordinary events, there is still the need to discharge excess water to the building's drainage system. This is because their hydraulic performance during extreme events tends to be fairly similar to standard roofs*."	
SUDS Stage	SUDS Measure	Measure Outline	Use on Site
Site Control	Attenuation Tank and Hydro-brake	Attenuation tanks are used to create a below ground void space for the temporary storage of surface water before controlled release to the stream. Hydro-brakes are used to restrict the outfall from the attenuation tank to the equivalent of the existing agricultural run-off. This ensures the	It is proposed to use a concrete attenuation tank to store surface water on site before discharging to the public surface water sewer via a hydro-brake.

		development will not give rise to any impact downstream of the site.	
	Petrol Interceptor	A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater run-off. It is typically used in road construction to prevent fuel contamination of water courses carrying away the run-off. Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads and entering a drain before being deposited into the first tank inside the interceptor. The first tank builds up a layer of the hydrocarbon as well as other scum preventing it from entering the water course.	A petrol Interceptor will be installed, upstream of the proposed Attenuation tank as a final treatment level before discharging to the attenuation tank.

4.5 Stormwater Calculations

The total impermeable area of the catchment including roads, car-parking and roofs, is approximately 0.49 Ha, and the peak outflow will be limited to 1 l/s in the 1 in 100-year event. The 1 in 100 year critical design storm plus an additional 20% for climate change has been used for storm water attenuation calculations and a storage volume requirement of 404 m^3 is determined. A total volume of 420 m^3 will be provided in a concrete tank located beneath the podium at the car parking level. The calculation for the storage design is included in Appendix E. The proposed surface water drainage network is indicated on Waterman Moylan drawings 21-118-P120 - Proposed Surface Water Drainage Layout.

4.6 Network Design

As described above, the proposed surface water drainage system for this development has been designed as a SUDS system and uses permeable paving, green roofs green podium, below ground attenuation together with flow control devices and petrol interceptor to treat run-off and remove pollutants to improve quality, restrict outflow and control quantity.

Strict separation of surface water and wastewater will be implemented within the development. Surface water local drains will be a minimum of 225mm dia. and generally will consist of PVC (to IS123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H and will be laid strictly in accordance with the requirements of Dun Laoghaire Rathdown County Council.

4.7 Interception Storage

Interception storage is defined in the SuDS Manual as *"the capture and retention on site of the first 5mm of the majority of rainfall events"*. In accordance with the table 24.6 of the SuDS Manual CIRIA C753 the following guidelines have been used in calculating the area of the site benefiting from interception storage;

Table 4 Interception Mechanisms (Table 24.6 The SuDs Manual)

Systems	Interception methods assumed compliant for zero runoff from the first 5mm of rainfall for 80% of events during the summer and 50% in winter.
Green Roofs/podium	All surfaces that have green roofs/podium.
Permeable Paving	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement. Where the pavement also drains an adjacent impermeable area, compliance can be assumed for all soil types where the pavement is unlined, as long as the extra paved area is no greater than the permeable pavement area

As described in section 4.4 and 4.5 the proposed development will provide, Green Roofs, green podium, and permeable paving. In order to calculate the percentage area of site benefiting from each form of interception storage the site areas are described in Table 6 below and demonstrated on Waterman Moylan drawing 21-118-P125.

At Podium level, all the hardstanding areas will be discharged into the landscape areas. The design will include a perforated pipe to convey surface water to the surface water network at ground level in order to discharge and attenuate water into the attenuation tank.

Table 5 Interception Storage Provided

Area	Total Hardstanding Area m2	Interception mechanism	Interception Area m2	green roof %	Percentage Benefiting %
Roof Blocks A-B-C	2079.9	Green Roof	1250.7	60.1	60.1
Podium Level	1592.2	Green podium	1592.2	N/A	100.0
Main Road and Footpaths	887.5	POROUS ASPHALT paving	663.0	N/A	91.8
		Permeable paving footpaths	152.0	N/A	
TOTAL	4559.6		3657.9	**N/A**	**80.2**

Within the basement carpark area, any rainwater entering the system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment.

5. SuDS Maintenance

For the SuDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, drain manholes (including catch pits) and attenuation tanks will ensure adequate performance. The recommended program is outlined in the tables below.

Table 6 Concrete Attenuation Tank Maintenance Schedule

SUDS Element	Maintenance		
Attenuation Tanks	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

Table 7 Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required

	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

Table 8 Green Roof Maintenance Schedule

SUDS Element	**Maintenance**		
Green Roof	**Maintenance Issues**	Vegetation becoming either overgrown or dying	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.	Annually and after severe storms
		Inspect underside of roof for evidence of leakage.	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.	Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	Six monthly or as required
	Remedial Work	If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required

		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

6. Benefits to the Surrounding Existing Drainage Network

It is important to note the very significant benefit the proposed development will have on the existing drainage network. The site currently discharges surface water, unrestricted to the public stormwater sewer. The proposed development will significantly reduce the surface water run-off to the watercourse as demonstrated in Table 11 below. The introduction of the SUDS measures outlined earlier will also improve the quality of the discharge.

Table 9 Surface Water Run-off rates

Rainfall Event	Existing development run-off (l/sec)	Proposed run-off (l/sec)	Difference (%)
Q1	12.43 l/s	0.9 l/s	-92.76%
Q30	30.24 l/s	0.9 l/s	-97.02%
Q100	47.62 l/s	0.9 l/s	-98.11%

7. Water Supply

7.1 Water Supply – General

There is one existing 6 inches diameter watermain supplying the site to the southwest corner. There is one existing 6 inches diameter Asbestos watermain along Ravens Rock Road to the west of the subject site which connects into a larger 14 inches diameter asbestos watermain along Carmanhall Road to the north.

A Pre-Connection Enquiry form was submitted to Irish Water in November 2021 which outlined the proposals for the water supply to the development to the north of the subject lands. Irish Water responded with the Confirmation of Feasibility (COF) on 25th January 2022, with reference no. CDS21008079, stating that a water connection to the public main is feasible without infrastructure upgrade by Irish Water. Please refer to Appendix B for the Irish Water Confirmation of Feasibility.

It is important to note that the Tack Site (subject site under this planning application) will be connected to the existing public watermain independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites, stating that Avid Site will need to be connected to the 6 inches diameter Asbestos main along Blackthorn Road.

The water demand for the proposed development is calculated according to the Irish Water Code of Practice and is set out in Table 12 below.

Table 10 Total Water Demand

Description	No. of Units	Flow l/h/day	Population per Unit	Total Discharge (l/d)
Residential Units	207	150	2.7	83,835
Crèche	1	50	78 67 pupils 11 staff	3,900
Total				***87,735 l/d***

The total water requirement from the public supply, for the development, is estimated at 88 m^3/day.

Waterman Moylan Drawing 21-118-P150 shows the proposed indicative water supply layout for the subject site.

8. Transport

8.1 Introduction

A site-specific Transport and Traffic Assessment (TTA) has been carried out by Waterman Moylan. This is included under separate cover as part of this application.

8.2 Site Access

Access to the proposed development is proposed Ravens Rock Road and egress onto Carmanhall Road.

An entrance only access is proposed on Ravens Rock Road for cars, service deliveries, refuse freighter and emergency vehicles. An exit only is proposed onto Carmanhall Road immediately to the west of the boundary between the subject site and the adjoining former Avid Technology site to the east.

These new entrance and exit points are also described in more detail in the accompanying TTA. They are in a 50 km/h zone. The junction into Carmanhall Road is designed to ensure a 2.4m x 45 metres in line with the Department of Transport 'Design Manual for Urban Roads and Streets' recommendation are provided as shown on the accompanying drawings. No development works will infringe upon this sightline provision.

8.3 Car Parking

Section 8.2.4.5 of the Dun Laoghaire Rathdown County Council Development Plan 2016 – 2022 consider the car parking requirements for various types of development. Specifically, Tables 8.2.3 set out the car parking standards for residential developments.

Based on these standards, Table 13 below details the maximum car parking spaces permitted for the proposed development.

Table 11 DLRCC Maximum Car Parking Required

Land Use	Units	Parking Standards	Car Parking Required
Apartments – 1 Bed	151	1 per unit	151
Apartments – 2 Bed	55	1.5 per unit	82
Apartments – 3 Bed+	1	2 per unit	2
Total	207	-	235

As per the Design Standards for New Apartments – Guidelines for Planning Authorities – December 2020, the subject proposed development meets criteria for reasonable grounds to minimise car parking provisions.

In suburban/urban locations served by public transport or close to town centres or employment areas and particularly for housing schemes with more than 45 dwellings per hectare net (18 per acre), as per guidelines mentioned above, planning authorities must consider a reduced overall car parking standard and apply an appropriate maximum car parking standard.

The development will provide74 No. car parking spaces located between the basement and undercroft car parking. This equates to 0.35 No spaces/apartment across the development.

8.4 Cycle Parking

- Section 4.1 of the 'Standard for Cycle Parking and Associated Cycling Facilities for New Developments – Dun Laoghaire-Rathdown County Council 2018' sets out the cycle parking requirements as follows:

Table 12 Total Cycle Parking Spaces Required (DLRCC)

Land Use	No. of Units	Standards	Long Stay parking required	Short Stay Parking Required	Total Parking Required
Apartments	207	1 space per unit- Long Stay 1 space per every 5 units – Short Stay	207	41	248
Creche	11 staff 67 children	1 space per every 5 staff – Long Stay 1 space per every 10 children – Short Stay	2	7	9
Total	-	-	209	48	257

- The Design Standards for New Apartments, who set out a requirement of 1 long stay space per bedroom and 1 visitor space for every two units, have also been reviewed with regards to cycle parking requirements and are set out in table 7.3 below.

Table 13 Total Cycle Parking Spaces Required (National Standards)

Land Use	No. of Units	Standards	Long Stay Parking Required	Short Stay Parking Required	Total Parking Required
Residential – 1 Bed	151	1 space per 1-bed unit – Long Stay 1 space per 2 units – Short Stay	151	75	227
Residential – 2 Bed	55	2 spaces per 2-bed unit - Long Stay 1 space per 2 units – Short Stay	55	27	82
Residential – 3 Bed	1	3 spaces per 3-bed unit - Long Stay 1 space per 2 units – Short Stay	1	1	2
Total	207 units		206	102	311

As can be seen on Table 14 above, the total number of cycle parking spaces required is 257. Table 15 shows a requirement for 311 spaces according to the National Standards. A total of 250 spaces will be provided of which 207 No. spaces will be provided for residents, and 43 No. spaces for visitors will be provided.

APPENDICES

A. Irish Water Records Map

carmanhall road - foul sewer

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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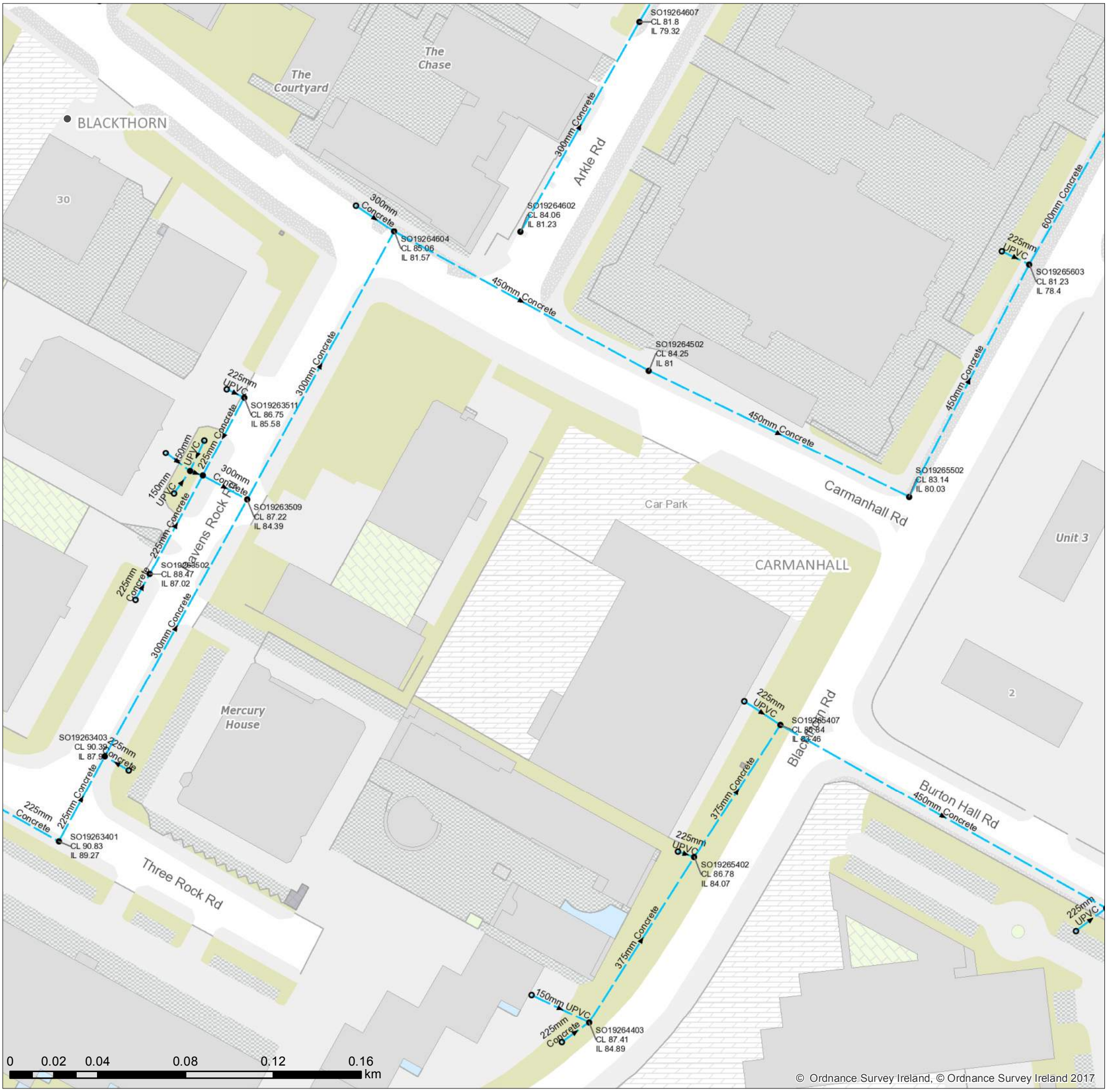
carmanhall road - stormwater



Water Distribution Network
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- Water Pump Station
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- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
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- Single Air Control Valve
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- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

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- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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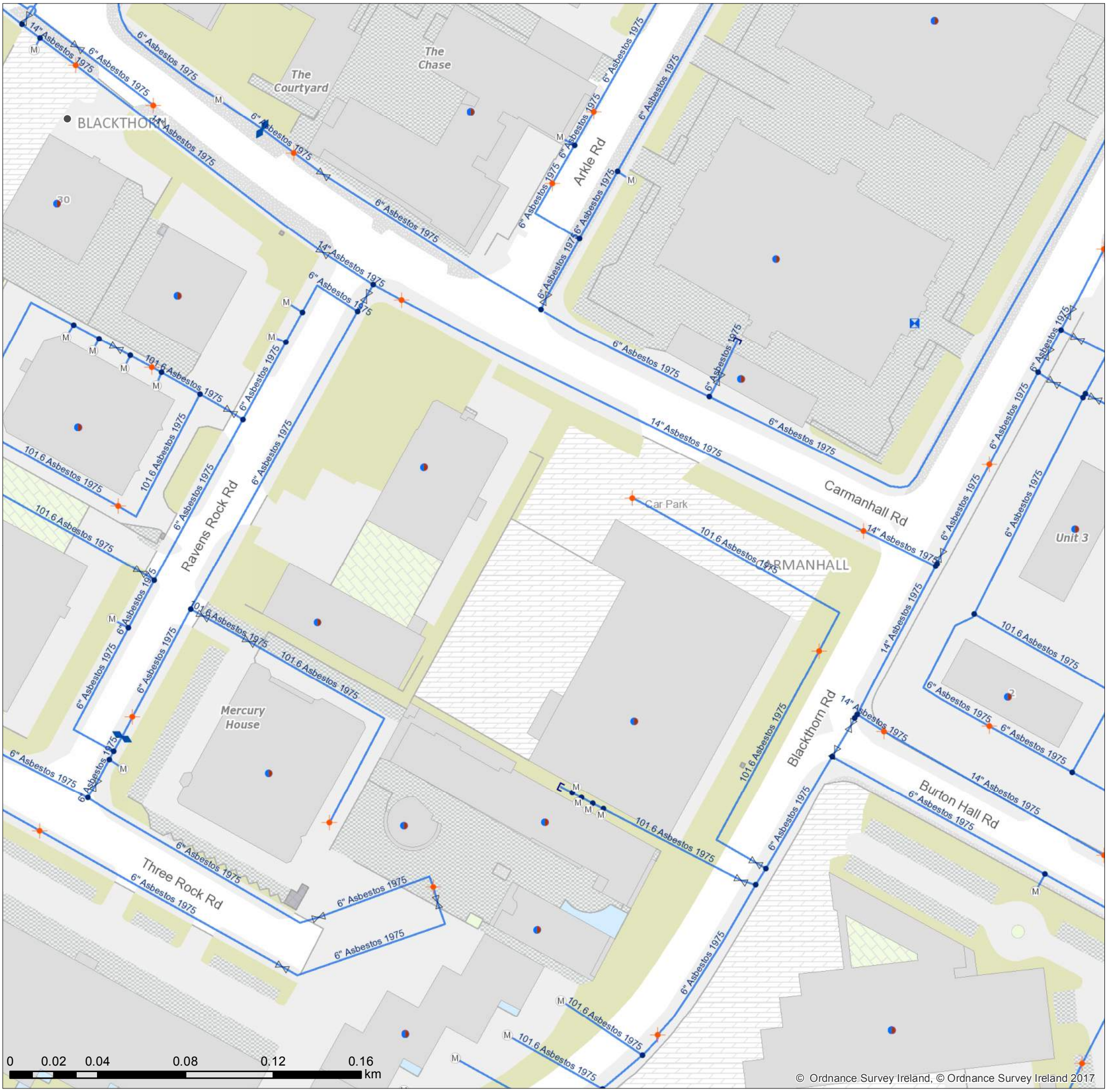
carmanhall road - watermains



Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

UISCE ÉIREANN : IRISH WATER

Print Date: 01/03/2022

Printed by:Irish Water

B. Irish Water Pre-Connection Enquiry Response

Jairo Rivero

Block S
Eastpoint Business Park
Alfie Byrne Road
Dublin
D03H3F4
Ireland

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

25 January 2022

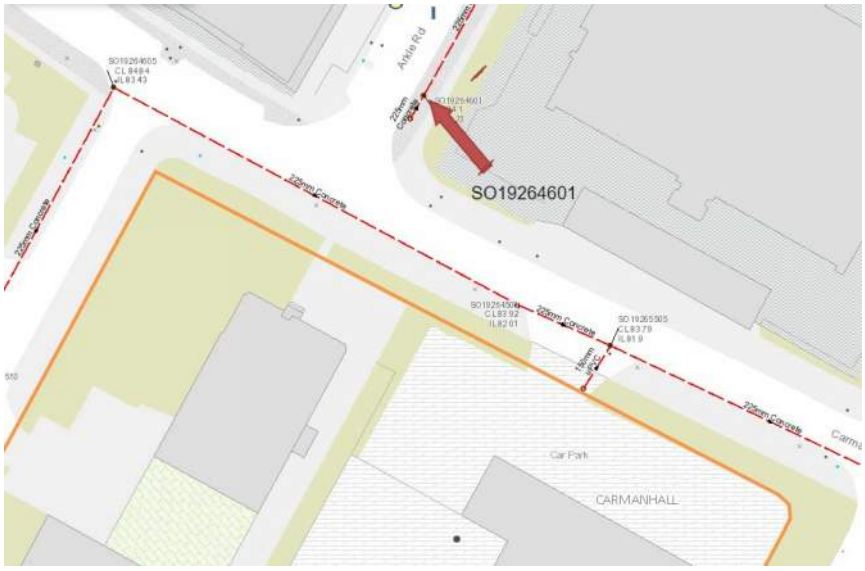
Re: CDS21008079 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 550 unit(s) at Ravens Rock Road, Sandyford, Dublin

Dear Sir/Madam,

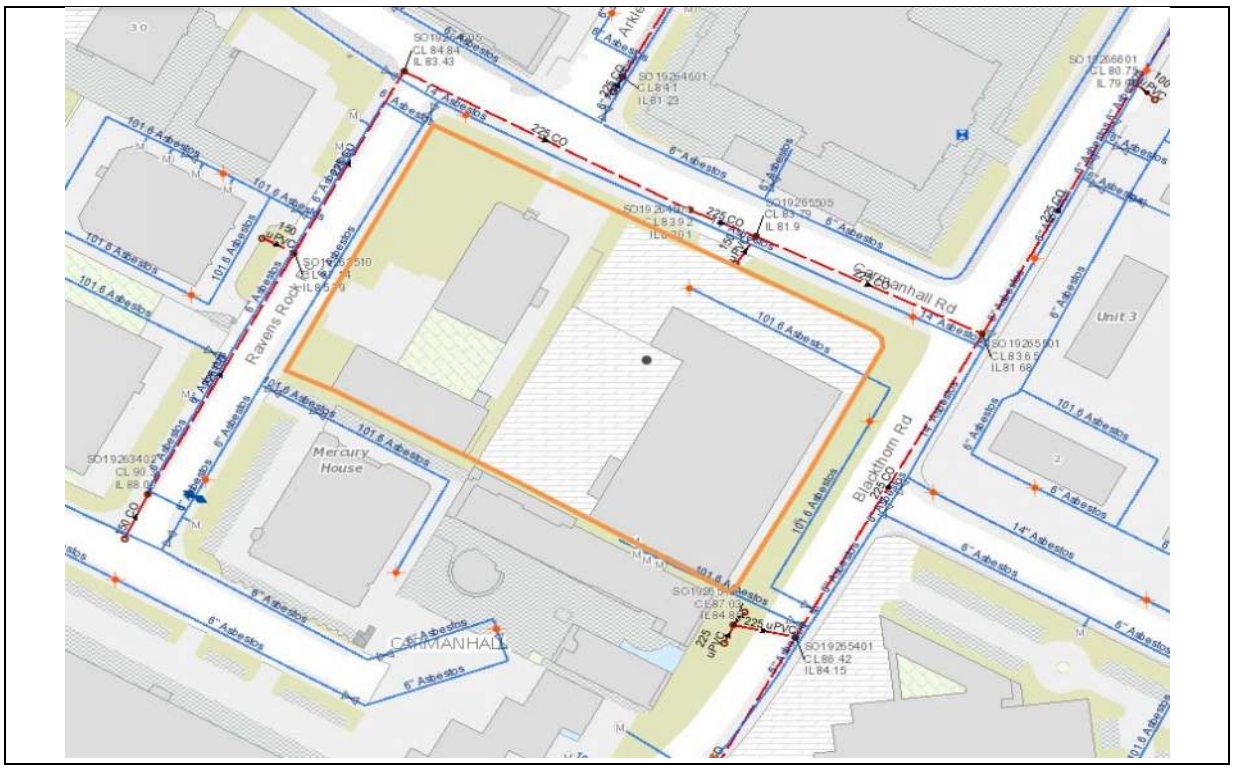
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Ravens Rock Road, Sandyford, Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	This Confirmation of Feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. Please note that Irish Water cannot guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development Connection is feasible to the 14” Asbestos main (Green in below screenshot) to the North of the site. A bulk meter is to be installed on this connection.

	A second connection is feasible to the 6” Asbestos main (Red in below screenshot) to the East of the site. A control valve is to be placed on this main allowing for this connection to be set to closed during normal operations. 
Wastewater Connection	Separate storm and foul water connection services have to be provided for the Development. The surface and storm water from the site must be discharged only into an existing storm water network that does not discharge to an IW combined/foul sewer. The connection arrangement should be agreed with the Local Authority Drainage Division. The connection has to be made to the Arkle Road (MH: SO19264601) network as shown below. A second connection to other sewers adjacent to the site are not feasible based on current constraints in the downstream network. 

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

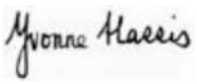
General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.

3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Kevin McManmon from the design team at kmcmanmon@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

C. Site Investigation Avid Site

PROPOSED DEVELOPMENT
SANDYFORD DUBLIN
MARLET PROPERTY

AECOM
CONSULTING ENGINEERS

CONTENTS

APPENDICES

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater.

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION
AT
FORMER AVID SITE

SANDYFORD
FOR

MARLET PROPERTY GROUP
AECOM CONSULTING ENGINEERS

Report No. 22455 **JUNE 2020**

I Introduction

A new multi-storey residential development is proposed for this site located at the junction of Blackthorn Road and Carmanhall Road in Sandyford. The site was formerly occupied by AVID, the old buildings have all been demolished and the area prepared for this new development.

An investigation of sub soil conditions in the developments area has been carried out by IGSL under the direction of AECOM Consulting Engineers, acting for the developers, MARLET Property Group.

The scope of works scheduled and completed is detailed below:

*	Cable Percussion Boreholes	4 nr.
•	Rotary Core Drilling	2 nr.
•	Trial Pits	12 nr.
•	CBR by Plate Test	1 nr.
•	Infiltration Test	2 nr.
•	Water and Gas Monitoring	
•	Geotechnical Laboratory Tests	
•	Environmental Laboratory Tests	

The investigation has been carried out in accordance with the various standards outlined in the foreword to this document. Field operations were completed in March 2020.

This report includes all factual data from field operations and laboratory including detailed geotechnical logs and laboratory data.

Recommendations for foundation construction are also presented in this report.

II Fieldwork

The development area is Brownfield following demolition of buildings and site preparation works. The surfaces ranged from hard-core fill to tarmac and topsoil.

The various exploratory locations are noted on the drawing enclosed in Appendix VII. This drawing was provided by AECOM. Each location was set out to the specified co-ordinates by IGSL site personnel.

All exploratory positions were scanned electronically (CAT) to ensure that existing services were not damaged. Hand excavation was also carried out to a depth of 1.00 metres at borehole locations to ensure that underground services were not damaged.

The various exploratory methods are discussed in the following paragraphs.

Boreholes

Boreholes were 200mm diameter and were constructed using conventional cable percussion equipment. Holes were referenced BH01 to BH04 and were located at the four corners of the site

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement. It was not possible to recover undisturbed samples because of the high stone/cobble content of the strata encountered.

The findings at the four locations are quite consistent. Surface FILL extends to depths ranging from 1.00 to 1.90 metres.

In all four boreholes stiff to very stiff brown and grey sandy gravelly CLAY is present below the FILL Boreholes continued in this stratum to refusal on obstructions at depths ranging from 7.30 to 11.20 metres. An increasing strength with penetration depth has been noted. Cobbles and boulders were present in the gravelly clay stratum.

This gravelly clay is GLACIAL TILL or BOULDER CLAY, very typical of the greater Dublin area.

BH02 and BH04 were dry during boring while slow to moderate water seepages were noted at 3.30 metres in BH01 and 3.10 metres in BH03. Slotted standpipes were installed in BH01 and BH02 to facilitate long term observation of ground water and permit measurement of any gas present.

Rotary Core Drilling

Rotary core drilling was scheduled at two locations to advance hole depth and establish bedrock horizon. These holes were bored through the boulder clay deposits to the underlying granite bedrock. Rotary holes were designated RC02 and RC04.

A GEO405 rig was used to drill and recover 78mm diameter core of rock using triple tube diamond drilling technique. Open-hole Symmetrix Drilling was used in the overburden soils

All recovered core was returned to the laboratory for detailed logging and photography. The geotechnical core logs are contained in Appendix II. The logs note Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) as well as presenting a fracture spacing log and detailed geological description.

The drilling was advanced through overburden described as stiff brown and black very gravelly clay with cobbles and boulders throughout.

Weak to Medium Strong grey GRANITE was noted in RC02 at 8.70 metres BGL and 100% core was recovered from 8.70 to 11.70 metres. This core was quite fractured with low SCR and RQD values.

At RC04 very weathered GRANITE was noted at 11.10 metres BGL. Drilling continued to 14.80 metres with only limited recovery of solid core in this location.

Sub samples of the recovered core were taken and sent to the materials laboratory for Point Load Strength Tests.

A 50mm slotted PVC standpipe was installed in both locations with gravel surround and surface seal, details of the installations are provided on the drilling record. Water was noted at final standing levels of 2.20 and 1.32 metres BGL .

Trial Pits

Trial Pits were excavated at twelve locations to establish stratification and permit sample recovery for environmental analysis. Trial Pits are referenced TP01 to TP12 and fully detailed records are presented in Appendix III. Photographs were also taken at each trial pit and these are also attached for record purposes.

The pits reflect a very high degree of consistency with FILL in all locations (varying from 0.30 to 1.20 metres in thickness) overlying stiff to very stiff BOULDER CLAY. All trial pits were completed at 3.00 metres and no ground water was encountered during the course of the investigation, other than a minor seepage at 2.00 metres in TP01. Excavations remained stable throughout.

Trial Pits were backfilled with compacted excavated material and the areas levelled.

Plate Bearing Test

The CBR value of the soil at shallow depth was established at one locations using Plate Bearing Test Apparatus. A steel plate is loaded and off-loaded incrementally over two stages and the deflection under load and recovery under off-load is measured by a system of dial gauges. The data is processed and load settlement graphs are prepared. An equivalent CBR value is calculated in accordance with NRA HD25-26/10.

The test was carried out at 0.50 metres on MADE GROUND. An equivalent CBR value of 10% was obtained on the Load Cycle, increasing considerably on re-load.

Test data sheets are presented in Appendix IV.

Infiltration Tests

Two infiltration tests were carried out in accordance with BRE Digest 365 in the specified locations. Test data is presented in Appendix V.

In both locations no fall in water table was noted over the specified period and a ZERO Infiltration Rate was recorded. The results are typical of the very low permeability boulder clays present on the site and in the general area.

The use of the local authority drainage system for disposal of storm and surface water is therefore recommended.

Water and Gas Monitoring

Standpipes were installed in four locations to facilitate long term monitoring of ground water levels and determine gas concentrations. Measurements were carried out at intervals following site completion.

Details are presented in Appendix VIc. Final standing water level has stabilised at approximately 2.00 metres BGL.

Concentrations of CO2, O2, and CH4 are negligible and no safety issues arise in this regard.

III. Testing

a) In-Situ :

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. Tests were also carried out in the rotary holes. N values are noted in the right hand column of the individual records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows. Where full test penetration was not achieved the blow count for a specific penetration is recorded, or refusal is indicated where appropriate. Results are summarised as follows.

Stratum / Depth	N Value Range	Comment
FILL DEPOSITS	14 to 17	Medium Dense
BOULDER CLAY		
2.00 metres BGL	21 to 32	Stiff
3.00 metres BGL	18 to 32	Stiff
4.00 metres BGL	28 to 43	Stiff to Very Stiff
5.00 metres BGL	35 to 42	Very Stiff
6.00 metres BGL	36 to 43	Very Stiff
7.00 metres BGL	39 to +50	Very Stiff to Hard
8.00 to 10.00	40 to +50	Very Stiff to Hard

Refusal of SPT apparatus was recorded at the base of each borehole possibly indicative of the granite bedrock horizon.

(b) Laboratory :

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical soil and rock testing was carried out by IGSL in its INAB-Accredited laboratory. Chemical testing was performed by CHEMTEST in a UKAS accredited laboratory.

The overall test programme included the following elements:

*	Moisture Content	IGSL
•	Liquid and Plastic Limits	IGSL
•	PSD Grading by wet sieve	IGSL
•	PSD Grading by Hydrometer	IGSL
•	Point Load Test on Rock Core	IGSL
•	Sulphate Chloride and pH	CHEMTEST
•	RILTA Suite Environmental	CHEMTEST

All test data is presented in Appendices VIa and VIb. and individual test results are discussed as follows:

Classification / Moisture Content

Six samples of the gravelly CLAY stratum from the boreholes had index properties established. Results consistently fall into Zone CL of the standard Classification, indicative of low plasticity sensitive clay matrix soils. Moisture content for the samples ranges from 11% to 17%. Results are typical of the local boulder clay.

Grading

Wet sieve analysis and hydrometer was used to establish PSD grading curves for four samples of the glacial till. The graphs reflect material graded smoothly from the clay to gravel fraction, the straight-line pattern of the graphs is typical of the local boulder clay deposition.

Point Load Test

The strength of the limestone bedrock has been established by Diametric Point Load Tests on four segments of core. Equivalent UCS values ranging from 4 to 40 MPa with an average UCS value of 23 MPa. The low results reflect the highly weathered and weak nature of the bedrock.

Chemical (BRE SOI Suite)

Five soil samples were selected for sulphate, Chloride and pH analysis. Sulphate concentrations (SO4 2:1 extract) of < 0.010 g/l were established with pH values of 8.4 to 8.7. Chloride contents were also consistently low <0.010 g/l. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for sulphate concentrations less than 0.5 g/l. No special precautions are therefore required to protect foundation concrete from sulphate or chloride aggression.

RILTA Suite Environmental

Sixteen samples of the MADE GROUND taken at 0.50 to 1.00 metre from each trial pit were submitted for detailed analysis to RILTA Suite (WAC) parameters.

Fifteen of the sixteen samples are classified as INERT with no elevated contaminant levels established.

In one sample however (TP05 @ 0.50m BGL) an elevated sulphate content was recorded, in excess of the permitted INERT limit. The remaining levels recorded in this sample were all below the INERT levels.

No traces of Asbestos were noted during routine screening.

IV Discussion:

A new multi-storey residential development is to be undertaken on this site in Sandyford. The nine-storey building will incorporate a single storey basement car park. A formation depth some 3.50 to 4.00 metres BGL is envisaged.

A detailed investigation of sub soil and bedrock conditions has been carried out under the direction of AECOM Consulting Engineers on behalf of MARLET Property Group.

Summary Stratification

The findings are very consistent and confirm the presence of shallow surface FILL over BOULDER CLAY deposits with GRANITE bedrock encountered at depth between approximately 9.00 and 11.00 metres.

The FILL extends to a maximum depth of about 1.50 metres and is firm or medium dense in situ, with N values in the range 14 to 17 and an in situ CBR value of 10%.

The BOULDER CLAY or glacial till comprises stiff to hard brown, grey and black sandy gravelly CLAY typically containing cobbles and boulders. SPT values increase with depth from about N=20 at 2.00 metres BGL to N > 50 below 7.00 metres.

The characteristics of the Dublin boulder clay are very well documented and the laboratory data for this site is consistent with the published data.

Ground water seepages were noted in several locations and long term water observations in standpipes indicates a final standing level of about 1.50 metres BGL for this site.

Variation in the general grading pattern of the till can occur, with an elevated granular content and increased moisture content often identified. Bands of water bearing clayey gravel can also typically occur within the generally cohesive soils.

Proposed Development

With regard to the proposed development (incorporating multi-storey construction over basement) the following geotechnical issues are discussed.

- Foundations / Bearing Capacity
- Piling
- Basement Construction
- Excavation / Ground Retention
- Groundwater Control / Uplift

Foundations / Bearing Capacity

At an assumed basement formation depth of 4.00 metres BGL, the sub soils consist of very stiff to hard dark brown or grey gravelly CLAY (Boulder Clay). SPT values at this depth range from N=28 to N=43 with an average value of N=36.

The boulder clay at 4.00 metres BGL should readily support an allowable bearing pressure of the order of 325 KPa for basement slab or column base construction.

N values at 5.00 metre BGL show an increase, with an allowable bearing pressure of the order of 375 KPa recommended at this depth.

The characteristics of the local boulder clay are well documented with numerous publications detailing behavioural and strength / settlement characteristics. The field and laboratory findings from this site are consistent with the extensive local data. The boulder clay will be sensitive to moisture content variation and should be protected from rainfall by blinding. Visual inspection of excavated formation by experienced personnel is also recommended to ensure uniformity and suitability of the founding medium. Any soft zones encountered should be removed and replaced with low-grade concrete.

Settlement in the very stiff to hard glacial till under the above loads should not exceed 5mm and differential movement should be negligible.

Piling

Should direct excavation to a suitable bearing stratum prove uneconomic from either an engineering or environmental viewpoint, the use of piling techniques can be considered.

Various piling techniques are available with specialist contractors, experienced in local ground conditions available to provide this service.

The stiff to hard black till encountered at about 2.00 metres extends to bedrock horizon at about 10.00 metres and can be used as founding medium for light to moderately loaded piles.

For multi-storey structures with high column loads it is likely that large diameter piles, rock socketed into the granite bedrock will be required.

Proof core drilling has indicated the presence of highly weathered non-intact granite at the soil rock interface, in excess of 3.00 metres in places.

Piling contractors should be consulted to determine the optimum solution for this site, having regard to the geotechnical data and to any possible environmental restraints.

Basement Construction

As a basement will be incorporated over the full footprint the very stiff to hard lodgement till at approximately 3.50 to 4.00 metres BGL is recommended as founding medium with an allowable bearing pressure of 300 to 350 KPa indicated by SPT values averaging N=36.

Settlement under this intensity of load will be low (< 5mm) and differential settlement will be negligible.

Excavation / Ground Retention

Assuming 4.00 metre deep basement construction a retaining wall structure will probably be required to support the soils, prevent undermining of sensitive adjoining buildings or roadways and preclude ground water ingress.

A number of ground retention techniques are available and each should be fully evaluated. These include the following:

- Steel Sheet Pile Wall
- Secant Pile Wall
- King Post Wall

Specialist contractors with will advise on the most suitable and economic option for this development.

Groundwater

Water ingress was noted in two of the boreholes at approximately 3.00 metres. The inflow was slight to moderate and control of ground water in basement excavation should be readily achieved by conventional pumping from local sumps.

Long-term water observation in standpipes has indicated a final standing level at approximately 2.00 metres BGL and this figure should be adopted in design against uplift.

Roads / Car Parking

A CBR value of 10% was obtained at 0.50 metres BG in the upper medium dense FILL. This should be suitable for pavement design. Visual inspection of pavement formation is recommended to ensure that all suspect or organic material is removed prior to construction.

Infiltration

Two percolation tests to BRE Digest 365 confirmed that the soils are unsuitable for dispersion of storm and surface water. The Local Authority drainage system should be utilised.

Environmental

The results of WAC analyses showed that one sample failed to satisfy the criteria for Inert waste as stipulated by the European Landfill Directive. The fact that only one element of one test out of sixteen analysed exceeded the INERT level, suggests that consultation with landfill operators may well result in acceptance of excavated material from this site.

The results of the RILTA Suite tests can be used to carry out a full Waste Characterisation Assessment (WCA). This assessment is carried out by an environmental specialist and determines whether the soils are Hazardous or Non-Hazardous in advance of being despatched to landfill. Given the test results a WCA may be relevant to this site and may be required by the landfill operators in the event of major excavation.

Concrete

Low sulphate and chloride contents were established with near neutral pH values. No special precautions are deemed necessary to protect foundation concrete.

IGSL/JC
June 2020

Appendix I Boring Records

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH1
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	7.30
		DATE COMMENCED	24/03/2020
		DATE COMPLETED	25/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.20						
	MADE GROUND (comprised of angular broken rock fill)			0.60						
	MADE GROUND (Comprised of gravelly clay with some stone)			1.00						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel and occasional cobbles				AA135559	B	1.00		N = 17 (6, 7, 4, 4, 4, 5)	
2					AA135560	B	2.00		N = 21 (4, 4, 5, 5, 5, 6)	
				2.50						
	Stiff, dark grey, sandy silty gravelly CLAY with occasional cobbles									
3					AA135561	B	3.00		N = 36 (4, 5, 6, 6, 7, 7)	
4					AA135562	B	4.00		N = 33 (6, 7, 7, 9, 8, 10)	
				4.30						
	Very stiff, brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders									
5					AA135563	B	5.00		N = 35 (4, 6, 7, 8, 8, 12)	
6					AA135564	B	6.00		N = 40 (7, 8, 8, 9, 11, 12)	
7					AA135565	B	7.00		N = 50/40 mm (25, 50)	
				7.30						
	Obstruction End of Borehole at 7.30 m									
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.8	5.1	0.75	
7.2	7.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.80	3.80	5.00	1.70	20	Moderate

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
25-03-20	7.30	1.00	7.00	50mm SP

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 29/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH2
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	8.50
		DATE COMMENCED	26/03/2020
		DATE COMPLETED	27/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.05						
	Firm, dark brown, sandy silty CLAY with occasional gravel and cobbles (Possibly Made Ground)				SPL1	B	1.00		N = 16 (2, 2, 4, 3, 5, 4)	
				1.90						
2	Stiff to very stiff , dark grey, sandy gravelly silty CLAY with cobbles				SPL2	B	2.00		N = 23 (4, 5, 5, 5, 6, 7)	
3					SPL3	B	3.00		N = 32 (5, 7, 7, 8, 8, 9)	
				3.60						
4	Very stiff, light brown, very sandy CLAY with some gravel				SPL4	B	4.00		N = 43 (6, 8, 10, 10, 11, 12)	
5					SPL5	B	5.00		N = 42 (9, 10, 10, 10, 11, 11)	
				5.40						
6	Very stiff to hard , grey and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders				SPL6	B	6.00		N = 44 (8, 9, 9, 10, 11, 14)	
7					SPL7	B	7.00		N = 39 (6, 8, 8, 9, 10, 12)	
8					SPL8	B	8.20		N = 50/75 mm (12, 18, 32, 18)	
				8.50						
9	Obstruction End of Borehole at 8.50 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.7	4.9	1.25	
8.3	8.5	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
27-03-20	8.50	1.00	8.50	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
27-03-20	5.40	5.40	0.30	

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 28/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH3
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	8.30
		DATE COMMENCED	23/03/2020
		DATE COMPLETED	24/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	MADE GROUND (Comprised of brown sandy gravelly clay fill with some brick and concrete fragments)			1.20	AA135561	B	1.00		N = 14 (2, 2, 3, 3, 4, 4)	
2	Stiff grey/brown sandy silty CLAY with some gravel and occasional cobbles				AA135562	B	2.00		N = 20 (3, 4, 4, 5, 6, 5)	
3					AA135563	B	3.00		N = 18 (2, 4, 5, 5, 4, 4)	
				3.90						
4	Very stiff dark brown gravelly CLAY				AA135564	B	4.00		N = 50/210 mm (8, 14, 14, 20, 16)	
5					AA135565	B	5.00		N = 35 (5, 6, 6, 8, 9, 10)	
6					AA135566	B	6.00		N = 36 (6, 7, 7, 8, 10, 11)	
				6.40						
7	Very stiff, brown and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders				AA135567	B	7.00		N = 40 (7, 8, 10, 10, 9, 11)	
8					AA135568	B	8.00		N = 50/75 mm (10, 14, 46, 4)	
				8.30						
9	Obstruction End of Borehole at 8.30 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.2	4.5	1	
8	8.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.10	3.10	4.20	1.60	20	Moderate

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 29/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH4
		SHEET	Sheet 1 of 2
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	11.20
		DATE COMMENCED	20/03/2020
		DATE COMPLETED	23/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel (Possibly Made Ground)			1.80	AA130581	B	1.00		N = 17 (2, 3, 4, 4, 4, 5)	
2	Very stiff, dark brown/black, sandy silty gravelly CLAY			3.10	AA130582	B	2.00		N = 32 (5, 6, 5, 8, 7, 9)	
3	Stiff, dark brown, very sandy gravelly CLAY with some cobbles			4.20	AA130583	B	3.00		N = 24 (3, 4, 4, 6, 7, 7)	
4	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders				AA130584	B	4.00		N = 28 (4, 5, 5, 7, 7, 8)	
5					AA130585	B	5.00		N = 35 (6, 8, 8, 9, 9, 9)	
6					AA130586	B	6.00		N = 43 (5, 8, 10, 10, 11, 12)	
7					AA130587	B	7.00		N = 42 (7, 9, 9, 10, 12, 11)	
8					AA130588	B	8.00		N = 41 (6, 7, 9, 11, 10, 11)	
9					AA130589	B	9.00		N = 43 (7, 9, 10, 11, 10, 12)	

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
2.3	2.5	1.25	
6.4	6.7	0.75	
10.9	11.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
20-03-20	4.50	4.50	DRY	
23-03-20	4.50	4.50	1.70	

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 23455.GPJ IGSL.GDT 25/6/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH4
		SHEET	Sheet 2 of 2
CO-ORDINATES	RIG TYPE Dando 2000	DATE COMMENCED	20/03/2020
GROUND LEVEL (m AOD)	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED	23/03/2020
	BOREHOLE DEPTH (m) 11.20		
CLIENT Marlet	SPT HAMMER REF. NO.	BORED BY	W.Cahill
ENGINEER AECOM	ENERGY RATIO (%)	PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
10	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders *(continued)*				AA120580	B	10.00		N = 46 (8, 8, 10, 10, 12, 14)	
11				11.20	AA120581	B	11.00		N = 50/95 mm (13, 12, 27, 23)	
	Obstruction End of Borehole at 11.20 m									
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
2.3	2.5	1.25	
6.4	6.7	0.75	
10.9	11.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U/T - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 26/5/20

Appendix II Rotary Core Records

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	DRILLHOLE NO	RC02
		SHEET	Sheet 1 of 2
CO-ORDINATES		DATE COMMENCED	11/03/2020
GROUND LEVEL (mOD)		DATE COMPLETED	12/03/2020
CLIENT	Marlet	DRILLED BY	IGSL
ENGINEER	AECOM	LOGGED BY	D.O'Shea
RIG TYPE	Geo405		
FLUSH	Air/Mist		
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	76		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.70			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY	1.80			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	2.30			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black gravelly CLAY				
4												
5												
6												
7												
8	8.70							SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	8.10			
9	9.30	100	100	85					8.70			

REMARKS

Hole cased 0.00-8.70m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-03-20	11.70	8.10	11.70	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford
DRILLHOLE NO	RC02
SHEET	Sheet 2 of 2
CO-ORDINATES	
GROUND LEVEL (mOD)	
RIG TYPE	Geo405
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78
DATE COMMENCED	11/03/2020
DATE COMPLETED	12/03/2020
CLIENT	Marlet
ENGINEER	AECOM
DRILLED BY	IGSL
LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10		100	0	0				Medium strong (where competent) to predominantly weak, massive to structureless, crystalline, grey/black/white mottled, fine to medium-grained, GRANITE, slightly to predominantly highly weathered (contributing to coreloss at 9.90-10.70m, 11.32-11.38m & 11.46-11.70m).				
	10.70							Discontinuities are rough, irregular. Apertures are open, commonly sandy clay-smeared. Dips are irregular. *(continued)*				
11		100	25	19					11.70			
	11.70							End of Borehole at 11.70 m				
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-8.70m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-03-20	11.70	8.10	11.70	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
12-03-20	11.70	8.70	9.03	Water level recorded 10mins after end of drilling

IGSL RC FI 10M 22455.GPJ IGSL.GDT 16/4/20

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	DRILLHOLE NO	RC04
		SHEET	Sheet 1 of 2
CO-ORDINATES		DATE COMMENCED	10/03/2020
GROUND LEVEL (mOD)		DATE COMPLETED	11/03/2020
CLIENT	Marlet	DRILLED BY	IGSL
ENGINEER	AECOM	LOGGED BY	D.O'Shea
RIG TYPE	Geo405		
FLUSH	Air/Mist		
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.90			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black sandy gravelly CLAY	2.20			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	3.20			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY with occasional cobbles	9.40			
4												
5												
6												
7												
8												
9								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY				

REMARKS

Hole cased 0.00-11.30m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To ↓	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-03-20	14.80	11.10	0.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford
DRILLHOLE NO	RC04
SHEET	Sheet 2 of 2
CO-ORDINATES	
GROUND LEVEL (mOD)	
RIG TYPE	Geo405
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78
DATE COMMENCED	10/03/2020
DATE COMPLETED	11/03/2020
CLIENT	Marlet
ENGINEER	AECOM
DRILLED BY	IGSL
LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	10.10			
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	11.10			
12	12.60								12.60			
13		32	10	0				Probable Weathered ROCK - recovered as sandy gravelly cobbles of GRANITE - Non intact				
14	14.80								14.80			
15								End of Borehole at 14.80 m				
16												
17												
18												
19												

REMARKS

Hole cased 0.00-11.30m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

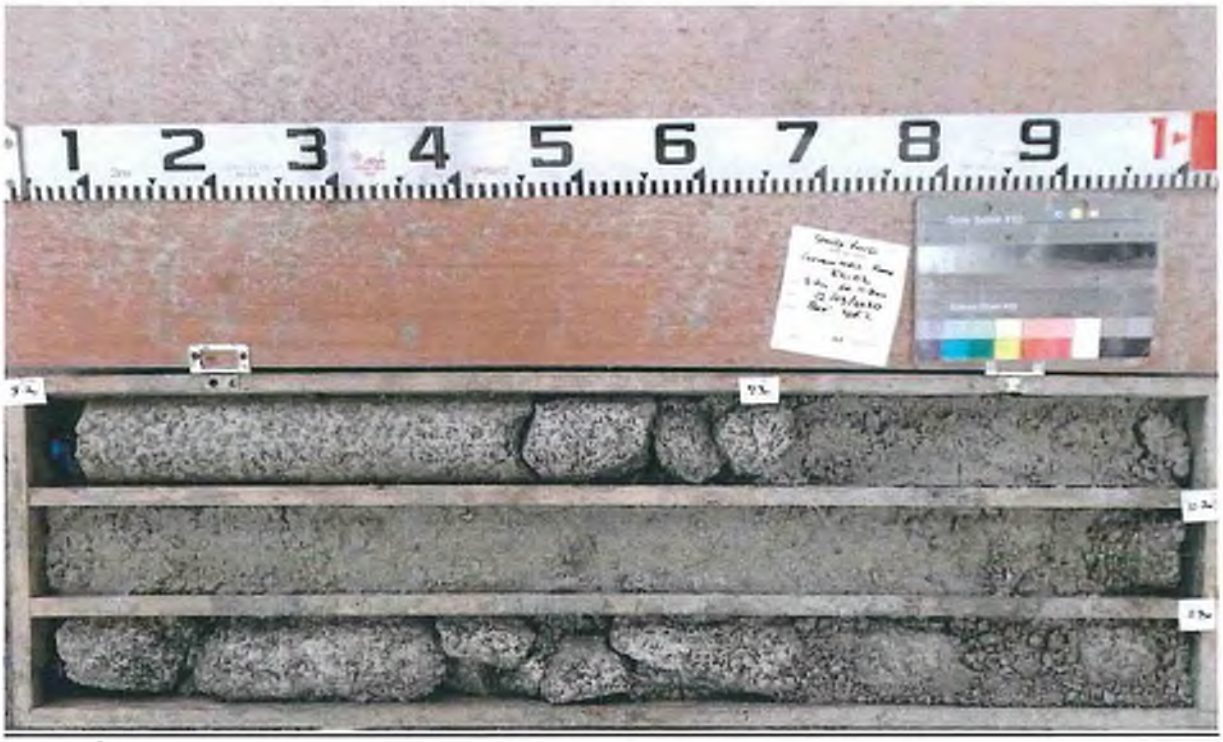
Date	Tip Depth	RZ Top	RZ Base	Type
11-03-20	14.80	11.10	0.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-03-20	14.80	11.30	1.80	Water level recorded 10mins after end of drilling

IGSL RC FI 10M 22455.GPJ IGSL.GDT 16/4/20

RC02 – Box 1 of 1 – 8.70-11.70m



RC04 – Box 1 of 1 – 12.60-14.80m

Appendix III Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp01
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
	CO-ORDINATES	DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Tar		0.10							
MADE GROUND - Dense sandy gravel. Gravels are fine to coarse and angular to sub rounded.		0.30							
MADE GROUND - Dense gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.50			AA131830	B	0.50		
Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded. Possible made ground.		1.10			AA131831	B	1.00		
Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131832	B	2.00		
Stiff - very stiff dark grey slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50			AA131833	B	2.80		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Seepage at 2 m.

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin
TRIAL PIT NO.	Tp02
SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon
CO-ORDINATES	
DATE STARTED	10/03/2020
DATE COMPLETED	10/03/2020
GROUND LEVEL (m)	
CLIENT	Marlet Property Groupd
ENGINEER	Aecom
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.		0.40							
Firm - stiff dark brown slightly silty gravelly CLAY. Gravels are fine to coarse and angular to sub rounded. Possible made ground.					AA131634	B	0.50		
Stiff dark brown very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA131635	B	1.10		
					AA131636	B	2.20		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.80							
End of Trial Pit at 3.00m		3.00			AA1318337	B	3.00		

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 20/5/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp03
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
	CO-ORDINATES	DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - Stiff brown very gravelly clay with rare plastic and metal pieces and high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131838	B	0.50		
1.0 Stiff dark brown gravelly CLAY with low cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.90			AA131839	B	1.00		
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.40			AA131840	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00			AA131841	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp04
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
		DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		

CO-ORDINATES

GROUND LEVEL (m)

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.									
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.50			AA131842	B	0.50		
1.0 Stiff dark brown very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.00			AA131843	B	1.00		
2.0 Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA131844	B	2.00		
					AA131845	B	2.80		
3.0 End of Trial Pit at 3.00m		3.00							
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp05
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
		DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	CO-ORDINATES		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND very dense very gravelly sand with occasional red brick metal plastic and concrete pieces and high cobble content and medium boulder content.					AA131846	B	0.50		
1.0 Stiff dark brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.20			AA131847	B	1.20		
2.0					AA131848	B	2.00		
Stiff - very stiff dark grey gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.70							
3.0 End of Trial Pit at 3.00m		3.00			AA131849	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp06
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND very gravelly sand with high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131850	B	0.50		
1.0 Stiff slightly sandy very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA136803	B	1.10		
2.0					AA136804	B	2.00		
Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.70							
3.0 End of Trial Pit at 3.00m		3.00			AA136805	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp07
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Tar		0.10							
MADE GROUND - very sandy gravel with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.40							
Stiff dark brown slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.60			AA136806	B	0.50		
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136807	B	1.00		
					AA136808	B	2.00		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50							
End of Trial Pit at 3.00m		3.00			AA136809	B	3.00		

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 3345.GPJ IGSL.GDT 25/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp08
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom	GROUND LEVEL (m)	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - Tar		0.10							
MADE GROUND - Dense very sandy gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.		0.30							
Stiff light brown slightly sandy very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.70			AA136810	B	0.50		
Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136811	B	1.00		
2.0 Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA136812	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00			AA136813	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 3345.GPJ IGSLGDT 3/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp09
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Dense very sandy very gravelly clay with plastic concrete and metal pieces and a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.		0.50							
Stiff light brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136814	B	0.50		
					AA136815	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.50							
					AA136816	B	2.00		
					AA136817	B	2.50		
End of Trial Pit at 3.00m		3.00							

0.0
1.0
2.0
3.0
4.0

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp10
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (kPa)	Hand Penetrometer (kPa)
MADE GROUND - very sandy gravel with medium cobble content. Gravels are fine to coarse and angular to sub rounded.		0.10							
Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.					AA136818	B	0.50		
Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.70			AA136819	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.80			AA136820	B	2.00		
					AA136821	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp11
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
		DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
CO-ORDINATES			
GROUND LEVEL (m)			

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Dense very sandy gravel with a medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.10							
Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.		0.50			AA136822	B	0.50		
Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136823	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with high cobble content and low boulder content . Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.80			AA136824	B	2.00		
					AA136825	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 20/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp12
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom	GROUND LEVEL (m)	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND dense very sandy gravel with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.10							
Stiff brown slightly sandy very gravelly clay with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable Made ground.		0.50			AA136626	B	0.50		
Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136627	B	1.00		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content and high cobble content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.20			AA136628	B	2.00		
Stiff yellowish orange silty gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.20			AA136629	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 33/3/20

Appendix IV CBR by Plate Test

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

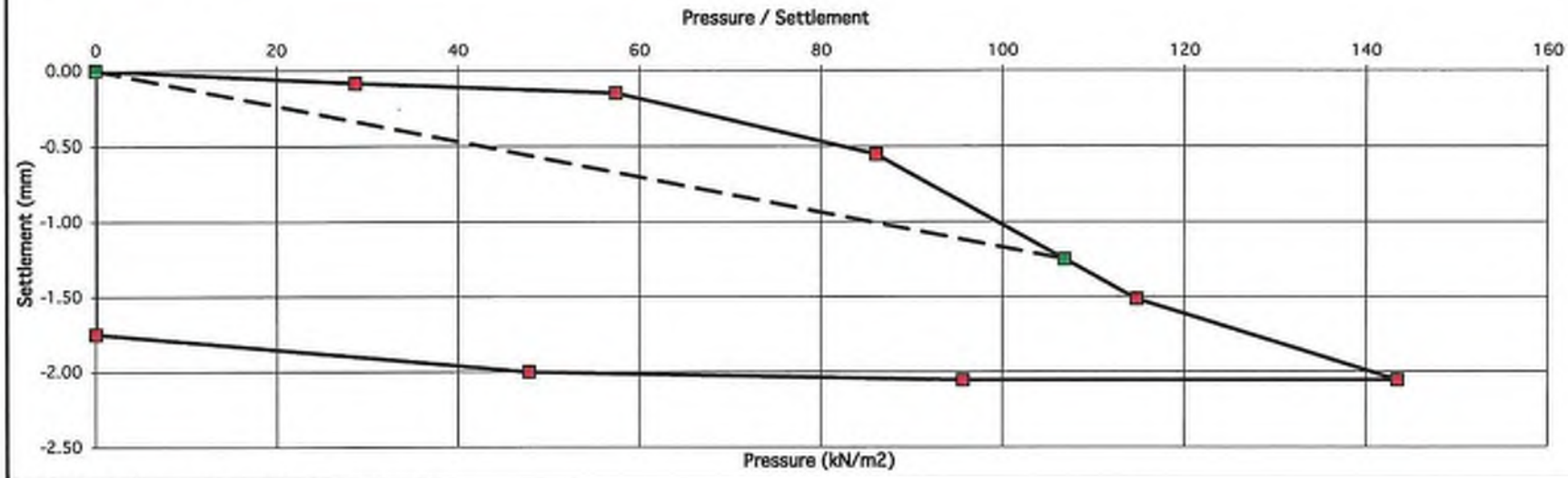
Reference No.	R110689
Contract	Avid site - Sandyford
Test No.	PT1 load
Location	39 carmanhall road
Depth	500 mm
Client	Marlet
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	
Date	10/03/2020

Description of soil under test
(natural soil, placed fill, sub-base)

MADE GROUND very gravelly clay.

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 85

Modulus of subgrade reaction = 55 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 10.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

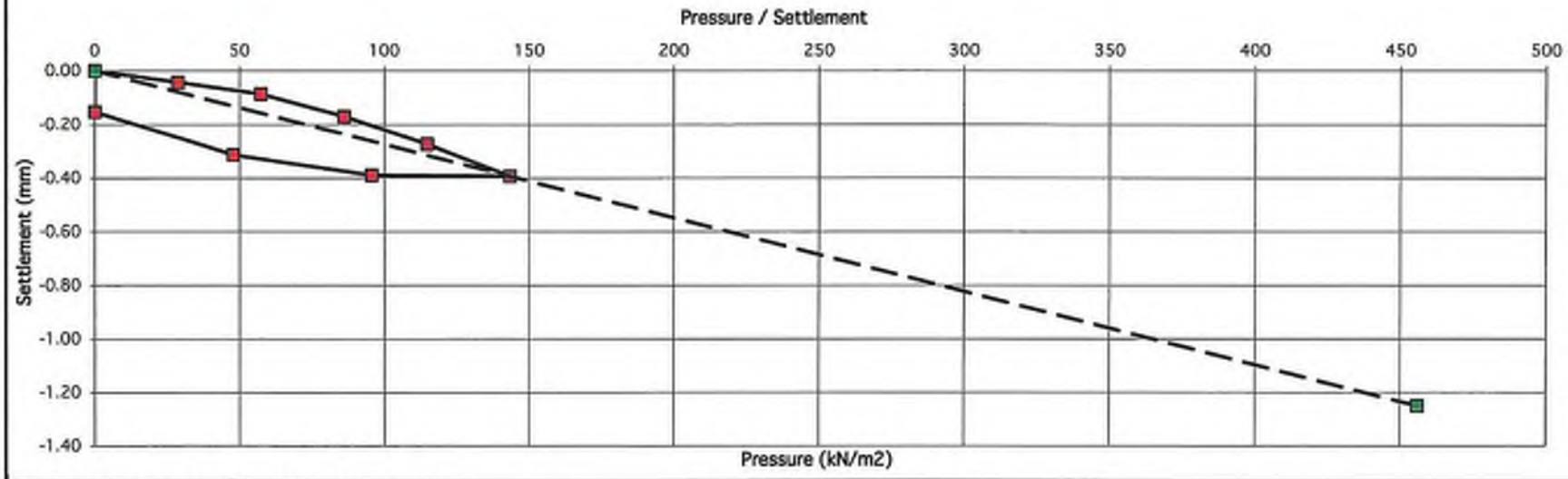
Reference No.	R110689
Contract	Avid site - Sandyford
Test No.	PT1 reload
Location	39 carmanhall road
Depth	500 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	
Date	10/03/2020

Description of soil under test
(natural soil, placed fill, sub-base)

MADE GROUND very gravelly clay.

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 365

Modulus of subgrade reaction = 234 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 123.5 %

Appendix V BRE Digest 365 Tests

Soakaway Design f -value from field tests (F2C) IGSI

Contract: Avid site 1-sandyford Contract No. 22455
Test No. SA01
Client Marlet
Date: 10/03/2020

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	None observed
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

Field Data

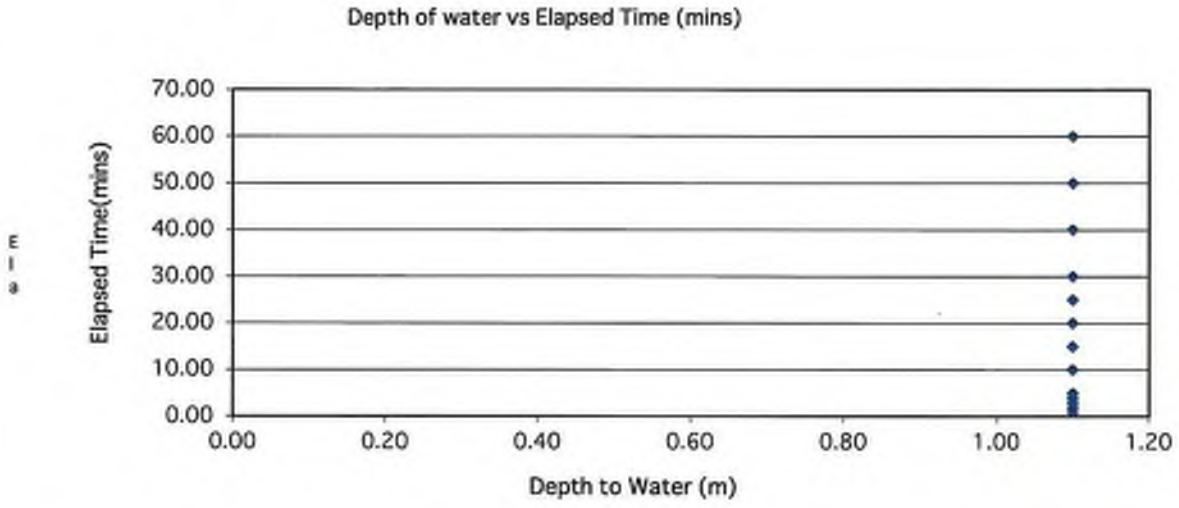
Depth to Water (m)	Elapsed Time (min)
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	10.00
1.10	15.00
1.10	20.00
1.10	25.00
1.10	30.00
1.10	40.00
1.10	50.00
1.10	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.84	m2
Total Exposed area =	2.74	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSI

Contract: Avid site 1-sandyford Contract No. 22455
Test No. SA02
Client Marlet
Date: 10/03/2020

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	None observed
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

Field Data

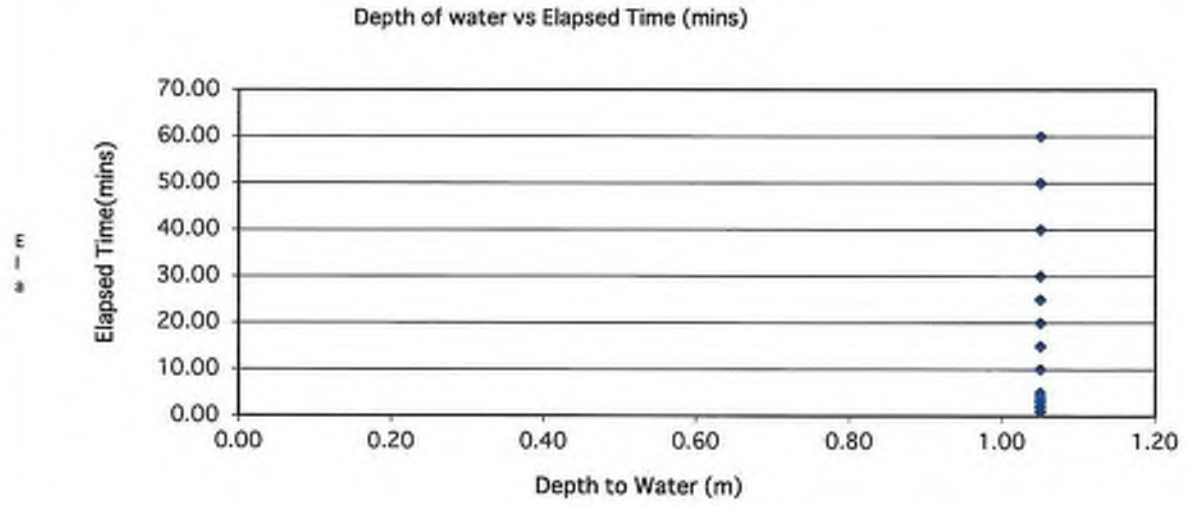
Depth to Water (m)	Elapsed Time (min)
1.05	1.00
1.05	2.00
1.05	3.00
1.05	4.00
1.05	5.00
1.05	10.00
1.05	15.00
1.05	20.00
1.05	25.00
1.05	30.00
1.05	40.00
1.05	50.00
1.05	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.05	m
Final depth to water =	1.05	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.07	m2
Total Exposed area =	2.97	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix VI Laboratory Data

a. Geotechnical Soil and Rock

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

Report No. **R111489** Contract No. 22455 Contract Name: Avid Development Sandyford

Customer Aecom/Marlet

Samples Received: 07/05/20 Date Tested: 22/05/20

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh01	135561	3.0	A20/1674	B	11	30	14	16	59	WS	4.4	C L	Brown sandy gravelly CLAY
Bh02	3	3.0	A20/1676	B	12	29	13	16	47	WS	4.4	C L	Brown sandy gravelly CLAY
Bh03	13553	3.0	A20/1678	B	13	29	12	17	46	WS	4.4	C L	Brown sandy gravelly CLAY
Bh03	13558	8.0	A20/1679	B	16	31	14	17	71	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh04	135083	3.0	A20/1680	B	14	34	16	18	44	WS	4.4	C L	Brown sandy gravelly CLAY
Bh04	130586	6.0	A20/1681	B	17	35	15	20	65	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY

Notes:
Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - Bulk Disturbed; U - Undisturbed

Remarks:
Results apply to the sample as received.
NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by	Date	Page
H Byrne	27/5/20	1 of 1

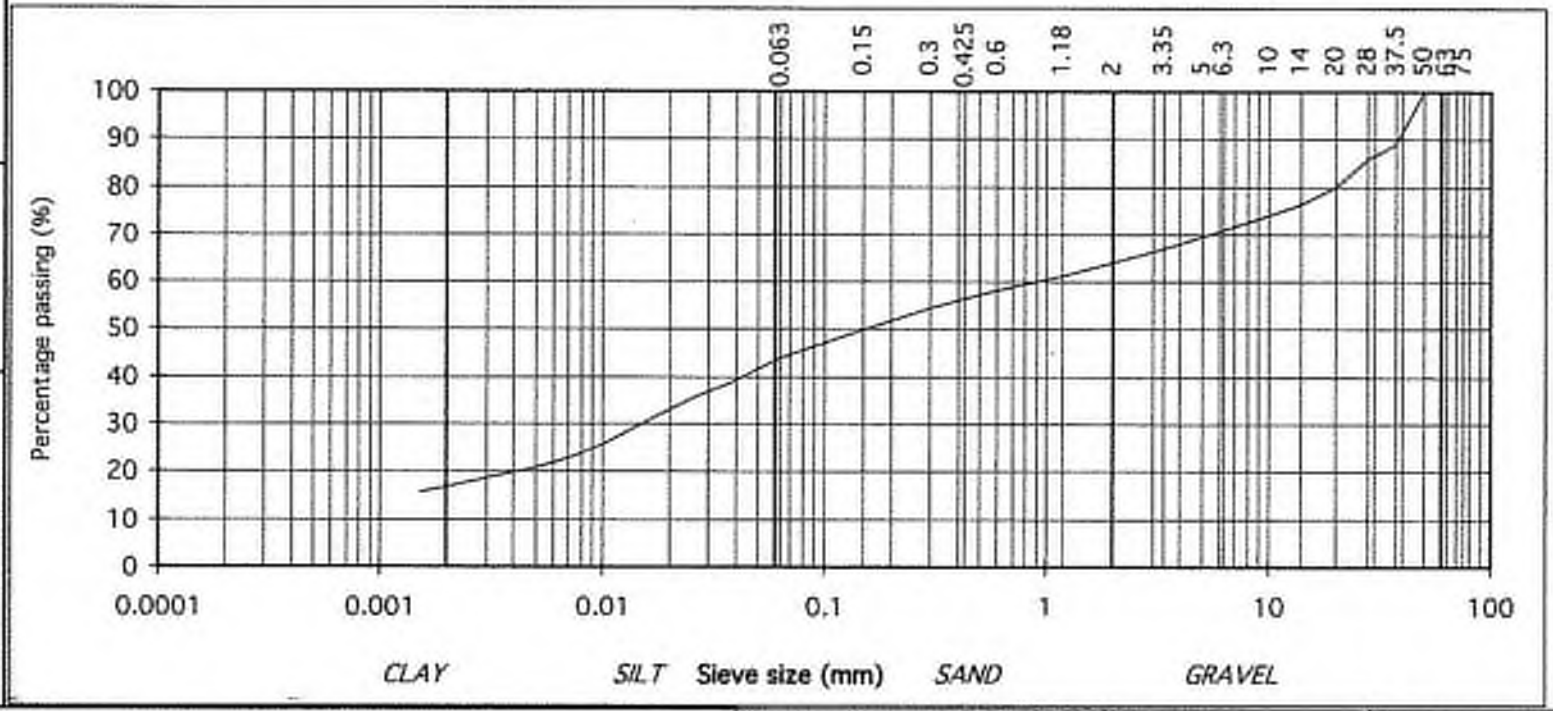
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	89	
28	86	
20	80	
14	76	
10	74	
6.3	71	
5	69	
3.35	67	
2	64	
1.18	61	SAND
0.6	58	
0.425	56	
0.3	54	
0.15	50	
0.063	44	SILT/CLAY
0.037	39	
0.027	36	
0.017	31	
0.010	26	
0.007	23	
0.005	21	
0.002	16	

Contract No: 22455 Report No. R111487
Contract: Avid Development Sandyford
BH/TP : BH01
Sample No. 135564 Lab. Sample No. A20/1675
Sample Type: B
Depth (m) 6.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	82	COBBLES
63	82	
50	82	GRAVEL
37.5	80	
28	80	
20	79	
14	77	
10	74	
6.3	72	
5	70	
3.35	66	
2	62	
1.18	58	SAND
0.6	55	
0.425	53	
0.3	51	
0.15	48	
0.063	44	SILT/CLAY
0.037	39	
0.027	36	
0.017	31	
0.010	26	
0.007	23	
0.005	21	
0.002	16	

Contract No: 22455 Report No. R111488

Contract: Avid Development Sandyford

BH/TP : BH02

Sample No. 7 Lab. Sample No. A20/1677

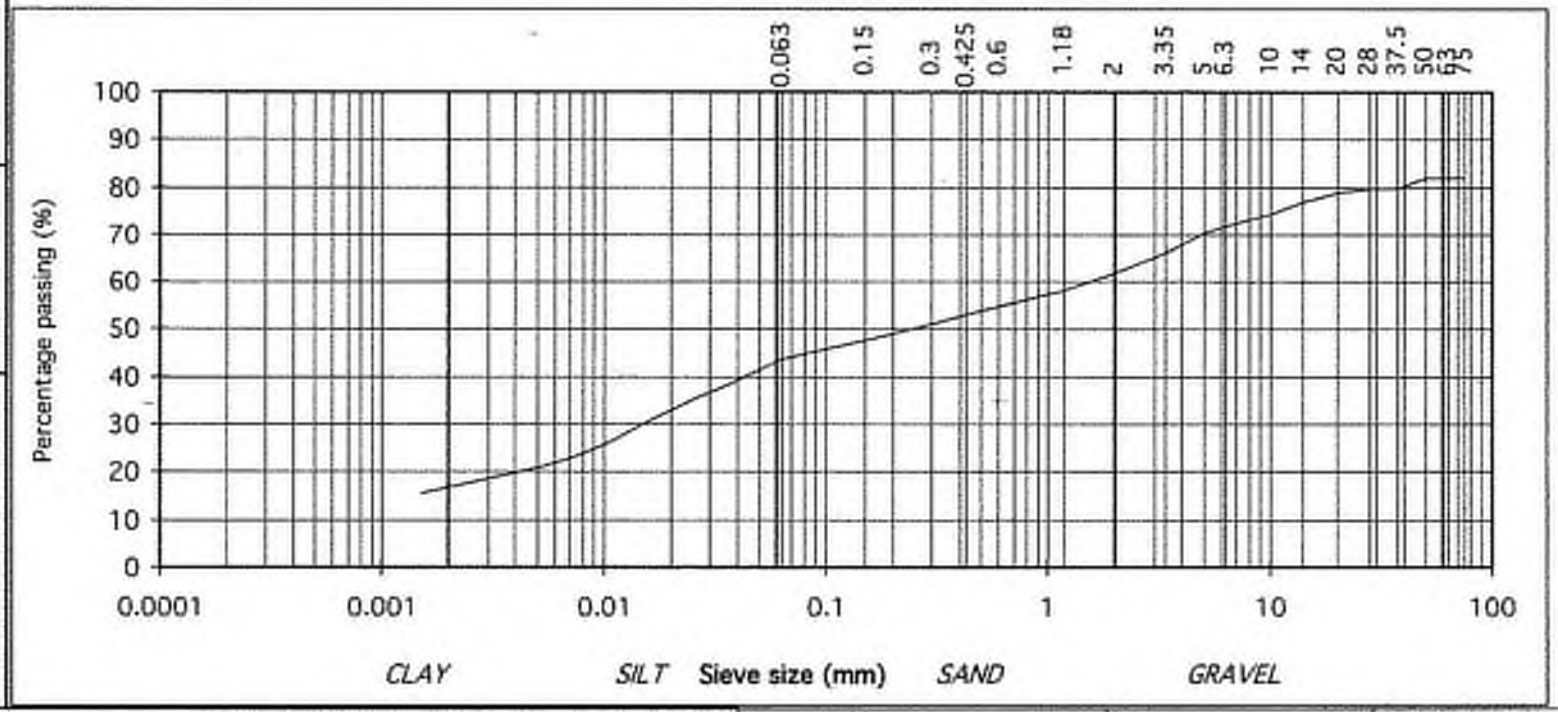
Sample Type: B

Depth (m) 7.00 Customer: Aecom/Marlet

Date Received 07/05/2020 Date Testing started 22/05/2020

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

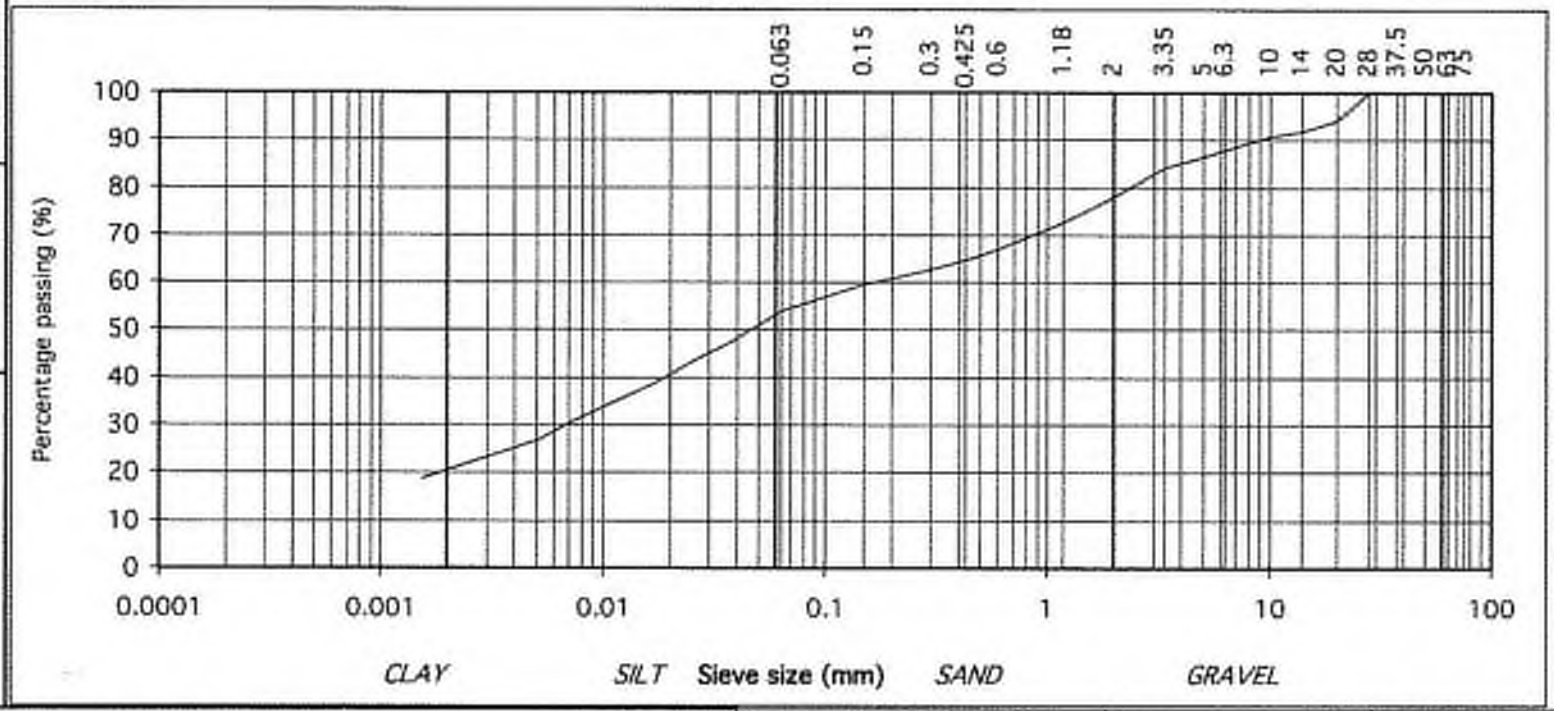
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	94	
14	92	
10	91	
6.3	88	
5	86	
3.35	84	
2	78	
1.18	73	SAND
0.6	67	
0.425	65	
0.3	63	
0.15	60	
0.063	54	SILT/CLAY
0.038	47	
0.027	44	
0.017	39	
0.010	34	
0.007	31	
0.005	27	
0.002	19	

Contract No: 22455 Report No. R111486
Contract: Avid Development Sandyford
BH/TP : BH03
Sample No. 13558 Lab. Sample No. A20/1679
Sample Type: B
Depth (m) 8.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

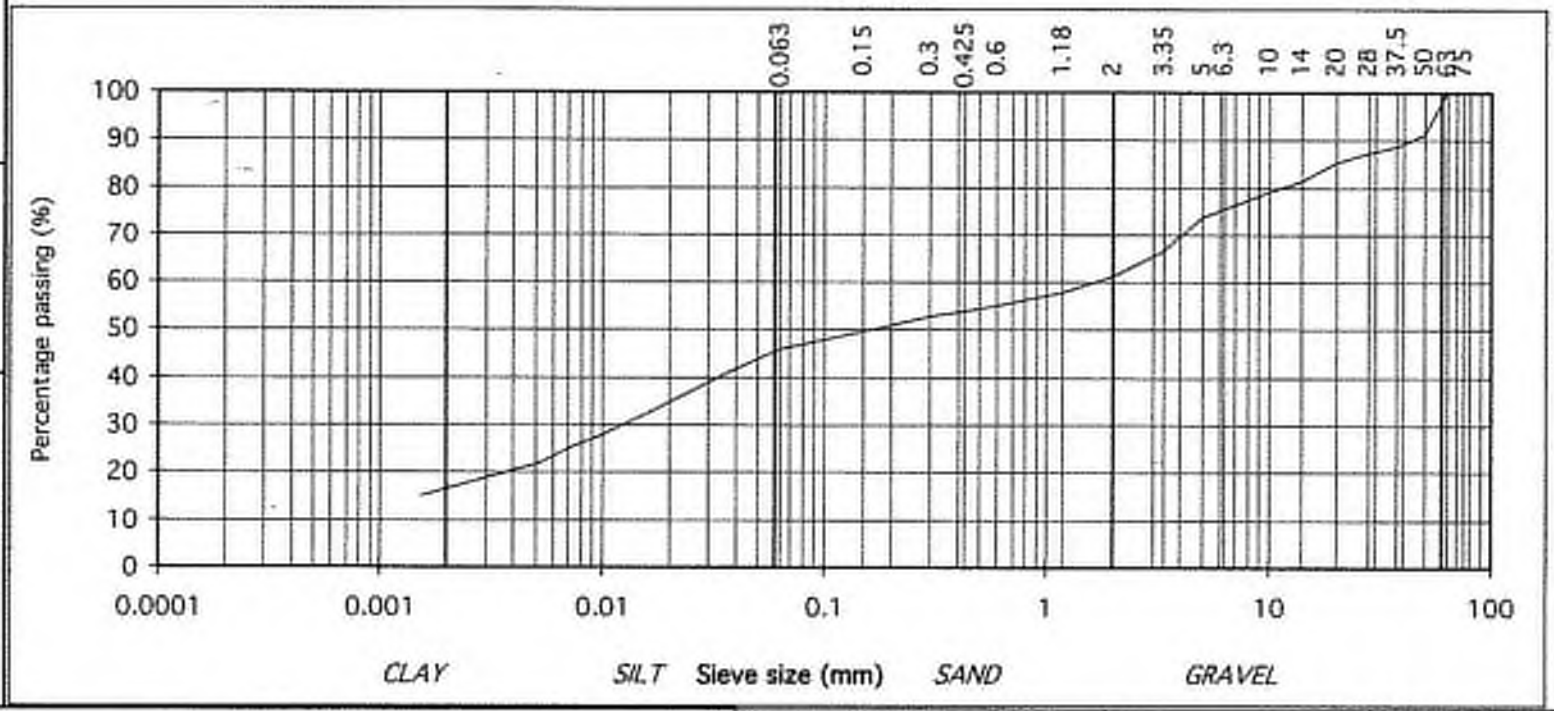
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	89	
28	87	
20	85	
14	81	
10	79	
6.3	75	
5	74	
3.35	67	
2	61	
1.18	58	SAND
0.6	55	
0.425	54	
0.3	53	
0.15	50	
0.063	46	SILT/CLAY
0.038	41	
0.027	38	
0.017	33	
0.010	28	
0.007	25	
0.005	22	
0.002	15	

Contract No: 22455 Report No. R111490
Contract: Avid Development Sandyford
BH/TP : BH04
Sample No. 130586 Lab. Sample No. A20/1681
Sample Type: B
Depth (m) 6.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	28/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

Contract: Avid Site, Sandyford
Contract no. 22455
Date of test: 16/04/2020

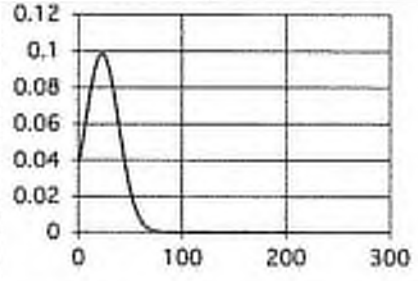
Sample Type: Core

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC02	8.8	76	8.0	1.222	1.31	1.61	32	d	//
	8.9	76	10.0	1.222	1.64	2.01	40	d	//
	10.9	76	4.0	1.222	0.66	0.80	16	d	//
RC04	12.8	76	1.0	1.222	0.16	0.20	4	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	4	4
Minimum	0.20	4
Average	1.15	23
Maximum	2.01	40
Standard Dev.	0.81	16
Upper 95% Confidence Limit	2.74	54.82
Lower 95% Confidence Limit	-0.43	-8.64

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Appendix VI Laboratory Data

b. Chemical and Environmental

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

mCERTS

Final Report

Report No.:	20-10240-1
Initial Date of Issue:	22-Apr-2020
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	22455 Avid Development Sandyford (Aecom / Marlet)

Quotation No.:		**Date Received:**	08-Apr-2020
Order No.:		**Date Instructed:**	14-Apr-2020
No. of Samples:	21		
Turnaround (Wkdays):	7	**Results Due:**	22-Apr-2020
Date Approved:	22-Apr-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL						Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:						Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	996083	996084	996085	996086
Order No.:						Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850	136807	136811	136814	136819
						Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	TP7	TP8	TP9	TP10
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50	1.00	1.00	0.50	1.00
						Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50	1.00	1.00	0.50	1.00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**														
pH	U	1010	10:1		N/A		8.5	8.3	8.7	8.4	8.8	8.9	10.2	8.5	10.6	9.3	9.3	10.4	9.4
Ammonium	U	1220	10:1	mg/l	0.050		0.058	0.14	0.21	1.7	< 0.050	0.18	< 0.050	0.16	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10		0.69	1.6	2.7	19	0.48	2.5	0.64	1.9	0.63	0.85	0.30	0.52	0.25
Boron (Dissolved)	U	1450	10:1	µg/l	20		27	26	29	32	< 20	29	< 20	< 20	23	< 20	< 20	20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		0.27	0.26	0.29	0.32	< 0.20	0.29	< 0.20	< 0.20	0.23	< 0.20	< 0.20	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL						Chemtest Job No.:	20-10240	20-10240	20-10240
Quotation No.:						Chemtest Sample ID.:	996087	996088	996089
Order No.:						Client Sample Ref.:	138822	136827	13559
						Sample Location:	TP11	TP12	BH1
						Sample Type:	SOIL	SOIL	SOIL
						Top Depth (m):	0.50	1.00	1.00
						Bottom Depth (m):	0.50	1.00	1.00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**				
pH	U	1010	10:1		N/A		9.4	9.2	9.1
Ammonium	U	1220	10:1	mg/l	0.050		< 0.050	< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10		0.29	0.51	0.42
Boron (Dissolved)	U	1450	10:1	µg/l	20		< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		< 0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:			Client Sample Ref.:		131830	131831	131834	131838	131839	131842	131846	131847	131850
			Sample Location:		TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
			Bottom Depth (m):		0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	15	16	12	13	8.6	8.2	5.9	17	7.3
pH (2.5:1)	N	2010		4.0									
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.68	0.49	< 0.40	0.48	< 0.40	< 0.40	< 0.40	0.42	0.53
Magnesium (Water Soluble)	N	2120	g/l	0.010									
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									
Total Sulphur	M	2175	%	0.010									
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] 3.7	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Chloride (Water Soluble)	M	2220	g/l	0.010									
Nitrate (Water Soluble)	N	2220	g/l	0.010									
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 3.2	[A] 2.2	[A] 8.1	[A] 9.2	[A] 5.2	[A] 6.5	[A] 7.1	[A] 2.1	[A] 7.2
Ammonium (Water Soluble)	M	2120	g/l	0.01									
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.074	[A] 0.015	[A] 0.029	[A] 0.054	[A] 0.031	[A] 0.038	[A] 0.45	[A] 0.045	[A] 0.11
Arsenic	M	2450	mg/kg	1.0	18	14	21	20	24	22	18	14	20
Barium	M	2450	mg/kg	10	120	98	71	91	46	47	49	68	61
Cadmium	M	2450	mg/kg	0.10	2.1	1.1	2.4	2.9	1.6	2.1	0.67	2.6	1.2
Chromium	M	2450	mg/kg	1.0	21	26	16	18	13	12	15	20	20
Molybdenum	M	2450	mg/kg	2.0	2.8	2.8	3.5	3.4	2.9	3.7	< 2.0	3.9	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	2.0	2.1	< 2.0	< 2.0	< 2.0	2.2	< 2.0
Copper	M	2450	mg/kg	0.50	27	21	26	32	20	22	15	29	19
Mercury	M	2450	mg/kg	0.10	0.17	0.15	< 0.10	0.16	< 0.10	< 0.10	< 0.10	0.11	< 0.10
Nickel	M	2450	mg/kg	0.50	41	39	48	53	37	41	22	56	32
Lead	M	2450	mg/kg	0.50	59	34	31	84	19	21	12	28	17
Selenium	M	2450	mg/kg	0.20	0.83	0.50	0.35	0.54	< 0.20	0.29	< 0.20	0.63	< 0.20
Zinc	M	2450	mg/kg	0.50	93	140	86	99	59	67	52	110	68
Chromium (Trivalent)	N	2490	mg/kg	1.0	21	26	16	18	13	12	15	20	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	[A] 1.6	[A] 0.50	[A] 0.52	[A] 0.98	[A] 0.35	[A] 0.35	[A] 0.31	[A] 0.61	[A] < 0.20
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	150	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:					Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850
					Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[j]fluoranthene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:					Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850
					Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 52	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 118	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 153	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 138	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 180	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:					Client Sample Ref.:	136807	136811	136814	136819	138822	136827	13559	135560	1
					Sample Location:	TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
					Bottom Depth (m):	1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-	-	-	-	-	-	-		
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
ACM Detection Stage	U	2192		N/A		-	-	-	-	-	-	-		
Moisture	N	2030	%	0.020		11	9.1	8.5	10	9.1	10	10	12	12
pH (2.5:1)	N	2010		4.0									[A] 8.6	[A] 8.7
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40		
Magnesium (Water Soluble)	N	2120	g/l	0.010									< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010									[A] 0.033	[A] 0.036
Sulphur (Elemental)	M	2180	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Chloride (Water Soluble)	M	2220	g/l	0.010									[A] < 0.010	[A] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010									< 0.010	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50		[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50		
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		[A] 6.6	[A] 7.8	[A] 9.3	[A] 8.3	[A] 8.3	[A] 7.6	[A] 6.6		
Ammonium (Water Soluble)	M	2120	g/l	0.01									0.02	0.04
Sulphate (Acid Soluble)	M	2430	%	0.010		[A] 0.011	[A] 0.013	[A] 0.083	[A] 0.012	[A] 0.033	[A] 0.010	[A] 0.017	[A] 0.018	[A] < 0.010
Arsenic	M	2450	mg/kg	1.0		23	22	23	23	24	21	23		
Barium	M	2450	mg/kg	10		71	63	65	100	50	62	71		
Cadmium	M	2450	mg/kg	0.10		2.3	1.9	1.2	2.0	1.8	2.0	2.0		
Chromium	M	2450	mg/kg	1.0		15	13	15	15	14	14	14		
Molybdenum	M	2450	mg/kg	2.0		3.4	3.4	2.5	3.7	3.4	3.6	3.5		
Antimony	N	2450	mg/kg	2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		
Copper	M	2450	mg/kg	0.50		26	22	19	26	23	26	25		
Mercury	M	2450	mg/kg	0.10		< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10		
Nickel	M	2450	mg/kg	0.50		51	41	32	47	42	46	46		
Lead	M	2450	mg/kg	0.50		21	18	20	19	23	18	19		
Selenium	M	2450	mg/kg	0.20		< 0.20	0.41	0.30	1.4	0.24	1.6	0.37		
Zinc	M	2450	mg/kg	0.50		79	76	64	76	67	75	74		
Chromium (Trivalent)	N	2490	mg/kg	1.0		15	13	15	15	14	14	14		
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total Organic Carbon	M	2625	%	0.20		[A] 0.28	[A] 0.35	[A] 0.56	[A] 0.38	[A] 0.31	[A] 0.34	[A] 0.34		
Mineral Oil	N	2670	mg/kg	10		< 10	< 10	< 10	< 10	< 10	< 10	< 10		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:			Client Sample Ref.:		136807	136811	136814	136819	138822	136827	13559	135560	1
			Sample Location:		TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Bottom Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10		
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.31	< 0.10	< 0.10	< 0.10	< 0.10		
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10		
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.7	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[j]fluoranthene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10	< 0.10	< 0.10		
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	< 0.10		
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.5	< 0.10	< 0.10	< 0.10	< 0.10		
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.5	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.51	< 0.10	< 0.10	< 0.10	< 0.10		
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.53	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.56	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10		

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:			Client Sample Ref.:		136807	136811	136814	136819	138822	136827	13559	135560	1
			Sample Location:		TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Bottom Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.37	< 0.10	< 0.10	< 0.10	< 0.10		
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	8.7	< 2.0	< 2.0	< 2.0	< 2.0		
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30		

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A			
Asbestos Identification	U	2192	%	0.001			
ACM Detection Stage	U	2192		N/A			
Moisture	N	2030	%	0.020	18	12	10
pH (2.5:1)	N	2010		4.0	[A] 8.4	[A] 8.5	[A] 8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010	[A] 0.055	[A] 0.11	[A] 0.044
Sulphur (Elemental)	M	2180	mg/kg	1.0			
Chloride (Water Soluble)	M	2220	g/l	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50			
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50			
Ammonium (Water Soluble)	M	2120	g/l	0.01	2.8	0.07	0.03
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.027	[A] < 0.010	[A] 0.022
Arsenic	M	2450	mg/kg	1.0			
Barium	M	2450	mg/kg	10			
Cadmium	M	2450	mg/kg	0.10			
Chromium	M	2450	mg/kg	1.0			
Molybdenum	M	2450	mg/kg	2.0			
Antimony	N	2450	mg/kg	2.0			
Copper	M	2450	mg/kg	0.50			
Mercury	M	2450	mg/kg	0.10			
Nickel	M	2450	mg/kg	0.50			
Lead	M	2450	mg/kg	0.50			
Selenium	M	2450	mg/kg	0.20			
Zinc	M	2450	mg/kg	0.50			
Chromium (Trivalent)	N	2490	mg/kg	1.0			
Chromium (Hexavalent)	N	2490	mg/kg	0.50			
Total Organic Carbon	M	2625	%	0.20			
Mineral Oil	N	2670	mg/kg	10			
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			
Benzene	M	2760	µg/kg	1.0			
Toluene	M	2760	µg/kg	1.0			
Ethylbenzene	M	2760	µg/kg	1.0			
m & p-Xylene	M	2760	µg/kg	1.0			
o-Xylene	M	2760	µg/kg	1.0			
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			
Naphthalene	M	2800	mg/kg	0.10			
Acenaphthylene	N	2800	mg/kg	0.10			
Acenaphthene	M	2800	mg/kg	0.10			
Fluorene	M	2800	mg/kg	0.10			
Phenanthrene	M	2800	mg/kg	0.10			
Benzo[j]fluoranthene	N	2800	mg/kg	0.10			
Anthracene	M	2800	mg/kg	0.10			
Fluoranthene	M	2800	mg/kg	0.10			
Pyrene	M	2800	mg/kg	0.10			
Benzo[a]anthracene	M	2800	mg/kg	0.10			
Chrysene	M	2800	mg/kg	0.10			
Benzo[b]fluoranthene	M	2800	mg/kg	0.10			
Benzo[k]fluoranthene	M	2800	mg/kg	0.10			
Benzo[a]pyrene	M	2800	mg/kg	0.10			
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10			
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10			

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10			
Coronene	N	2800	mg/kg	0.10			
Total Of 17 PAH's	N	2800	mg/kg	2.0			
PCB 28	U	2815	mg/kg	0.010			
PCB 52	U	2815	mg/kg	0.010			
PCB 90+101	U	2815	mg/kg	0.010			
PCB 118	U	2815	mg/kg	0.010			
PCB 153	U	2815	mg/kg	0.010			
PCB 138	U	2815	mg/kg	0.010			
PCB 180	U	2815	mg/kg	0.010			
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10			
Total Phenols	M	2920	mg/kg	0.30			

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240						
Chemtest Sample ID:	996074						
Sample Ref:	131830						
Sample ID:							
Sample Location:	TP1						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Landfill Waste Acceptance Criteria Limits**		
					Inert Waste Landfill	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 1.6	3	5	6
Loss On Ignition	2610	M	%	5.5	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0093	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0011	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0033	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.47	4.7	10	150	500
Sulphate	1220	U	16	160	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.5	95	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	15

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996075						
Sample Ref:	131831						
Sample ID:							
Sample Location:	TP1						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.50	3	5	6
Loss On Ignition	2610	M	%	3.7	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.028	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0030	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	3.2	32	1000	20000	50000
Total Dissolved Solids	1020	N	62	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.9	59	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	16

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996076						
Sample Ref:	131834						
Sample ID:							
Sample Location:	TP2						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.52	3	5	6
Loss On Ignition	2610	M	%	3.1	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0065	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0014	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0076	0.076	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	19	190	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996077						
Sample Ref:	131838						
Sample ID:							
Sample Location:	TP3						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.98	3	5	6
Loss On Ignition	2610	M	%	4.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.083	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0015	< 0.050	0.5	2	25
Barium	1450	U	0.023	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0031	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0047	< 0.050	0.5	10	30
Nickel	1450	U	0.0018	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	0.0015	0.015	0.06	0.7	5
Selenium	1450	U	0.0011	0.011	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	5.7	57	1000	20000	50000
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	14	140	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996078						
Sample Ref:	131839						
Sample ID:							
Sample Location:	TP3						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0015	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0052	0.052	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	2.2	22	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.0	80	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.6

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996079						
Sample Ref:	131842						
Sample ID:							
Sample Location:	TP4						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0020	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0074	0.074	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	7.1	71	1000	20000	50000
Total Dissolved Solids	1020	N	57	570	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.6	56	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.2

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996080						
Sample Ref:	131846						
Sample ID:							
Sample Location:	TP5						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.31	3	5	6
Loss On Ignition	2610	M	%	1.7	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		10.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0011	< 0.050	0.5	2	25
Barium	1450	U	0.023	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0041	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00069	0.0069	0.01	0.2	2
Molybdenum	1450	U	0.0034	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0010	0.010	0.1	0.5	7
Zinc	1450	U	0.011	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	310	3100	1000	20000	50000
Total Dissolved Solids	1020	N	400	4000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	5.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996081						
Sample Ref:	131847						
Sample ID:							
Sample Location:	TP5						
Top Depth(m):	1.20						
Bottom Depth(m):	1.20						
Sampling Date:					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	M	%	[A] 0.61	3	5	6
Loss On Ignition	2610	M	%	3.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.037	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0061	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0041	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	16	160	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.3	63	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996082						
Sample Ref:	131850						
Sample ID:							
Sample Location:	TP6						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] < 0.20	3	5	6
Loss On Ignition	2610	M	%	2.0	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		10.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0029	< 0.050	0.5	2	25
Barium	1450	U	0.0040	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0040	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0031	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	23	230	1000	20000	50000
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.3

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996083						
Sample Ref:	136807						
Sample ID:							
Sample Location:	TP7						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.28	3	5	6
Loss On Ignition	2610	M	%	2.5	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.19	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0072	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.14	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.29	2.9	10	150	500
Sulphate	1220	U	2.0	20	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996084						
Sample Ref:	136811						
Sample ID:							
Sample Location:	TP8						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.2	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0014	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0089	0.089	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.7	57	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996085						
Sample Ref:	136814						
Sample ID:							
Sample Location:	TP9						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.56	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	8.7	100	--	--
pH	2010	M		9.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0017	< 0.050	0.5	2	25
Barium	1450	U	0.0043	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0018	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.015	0.15	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0011	0.011	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	42	420	1000	20000	50000
Total Dissolved Solids	1020	N	120	1200	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.5

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996086						
Sample Ref:	136819						
Sample ID:							
Sample Location:	TP10						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.38	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.13	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0019	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0071	0.071	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	2.1	21	1000	20000	50000
Total Dissolved Solids	1020	N	53	<530	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.2	52	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240							
Chemtest Sample ID:	996087							
Sample Ref:	138822							
Sample ID:								
Sample Location:	TP11							
Top Depth(m):	0.50							
Bottom Depth(m):	0.50							
Sampling Date:								
						Landfill Waste Acceptance Criteria Limits		
Determinand	SOP	Accred.	Units			Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%		[A] 0.31	3	5	6
Loss On Ignition	2610	M	%		2.3	--	--	10
Total BTEX	2760	M	mg/kg		[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg		< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg		[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg		< 2.0	100	--	--
pH	2010	M			8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg		0.14	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l		10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0013		< 0.050	0.5	2	25
Barium	1450	U	0.0020		< 0.50	20	100	300
Cadmium	1450	U	< 0.00010		< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010		< 0.050	0.5	10	70
Copper	1450	U	< 0.0010		< 0.050	2	50	100
Mercury	1450	U	0.00052		0.0052	0.01	0.2	2
Molybdenum	1450	U	0.0072		0.072	0.5	10	30
Nickel	1450	U	< 0.0010		< 0.050	0.4	10	40
Lead	1450	U	< 0.0010		< 0.010	0.5	10	50
Antimony	1450	U	0.0021		0.021	0.06	0.7	5
Selenium	1450	U	< 0.0010		< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010		< 0.50	4	50	200
Chloride	1220	U	< 1.0		< 10	800	15000	25000
Fluoride	1220	U	0.19		1.9	10	150	500
Sulphate	1220	U	8.3		83	1000	20000	50000
Total Dissolved Solids	1020	N	49		490	4000	60000	100000
Phenol Index	1920	U	< 0.030		< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.7		77	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996088						
Sample Ref:	136827						
Sample ID:							
Sample Location:	TP12						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.34	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.15	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00050	0.0050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.14	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	1.8	18	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.3	73	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996089						
Sample Ref:	13559						
Sample ID:							
Sample Location:	BH1						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.34	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0031	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00062	0.0062	0.01	0.2	2
Molybdenum	1450	U	0.012	0.12	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	2.1	21	1000	20000	50000
Total Dissolved Solids	1020	N	52	520	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.3	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996074	131830		TP1		A	Amber Glass 250ml
996074	131830		TP1		A	Plastic Tub 500g
996075	131831		TP1		A	Amber Glass 250ml
996075	131831		TP1		A	Plastic Tub 500g
996076	131834		TP2		A	Amber Glass 250ml
996076	131834		TP2		A	Plastic Tub 500g
996077	131838		TP3		A	Amber Glass 250ml
996077	131838		TP3		A	Plastic Tub 500g
996078	131839		TP3		A	Amber Glass 250ml
996078	131839		TP3		A	Plastic Tub 500g
996079	131842		TP4		A	Amber Glass 250ml
996079	131842		TP4		A	Plastic Tub 500g
996080	131846		TP5		A	Amber Glass 250ml
996080	131846		TP5		A	Plastic Tub 500g
996081	131847		TP5		A	Amber Glass 250ml
996081	131847		TP5		A	Plastic Tub 500g
996082	131850		TP6		A	Amber Glass 250ml
996082	131850		TP6		A	Plastic Tub 500g
996083	136807		TP7		A	Amber Glass 250ml
996083	136807		TP7		A	Plastic Tub 500g
996084	136811		TP8		A	Amber Glass 250ml
996084	136811		TP8		A	Plastic Tub 500g

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996085	136814		TP9		A	Amber Glass 250ml
996085	136814		TP9		A	Plastic Tub 500g
996086	136819		TP10		A	Amber Glass 250ml
996086	136819		TP10		A	Plastic Tub 500g
996087	138822		TP11		A	Amber Glass 250ml
996087	138822		TP11		A	Plastic Tub 500g
996088	136827		TP12		A	Amber Glass 250ml
996088	136827		TP12		A	Plastic Tub 500g
996089	13559		BH1		A	Amber Glass 250ml
996089	13559		BH1		A	Plastic Tub 500g
996090	135560		BH1		A	Amber Glass 250ml
996090	135560		BH1		A	Plastic Tub 500g
996091	1		BH2		A	Amber Glass 250ml
996091	1		BH2		A	Plastic Tub 500g
996092	13551		BH3		A	Amber Glass 250ml
996092	13551		BH3		A	Plastic Tub 500g
996093	13553		BH3		A	Amber Glass 250ml
996093	13553		BH3		A	Plastic Tub 500g
996094	130581		BH4		A	Amber Glass 250ml
996094	130581		BH4		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID

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Test Methods

SOP	Title	Parameters included	Method summary
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix VI Test Data

c. Water Levels and Gas Concentrations

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.
Project No.	22455
Client	Market
Date	20th March 2020

	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.5	2.9	2.2	2.4				
GAS FLOW	n/a	n/a	n/a	n/a				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.1	0.0	0.2	0.0				
O2(%)	20.7	19.9	19.6	20.6				
BAROMETRIC PRESURE (mb)	1014	1014	1014	1014				
WEATHER	Sunny	Sunny	Sunny	Sunny				
COMMENTS								

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.							
Project No.	22455							
Client	Marlet							
Date	15th May 2020							
	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.2	2.6	1.9	2.05				
GAS FLOW	n/a	n/a	n/a	n/a				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.1	0.0	0.1	0.0				
O2(%)	20.5	19.7	19.9	20.1				
BAROMETRIC PRESURE (mb)	1006	1006	1006	1006				
WEATHER	Sunny	Sunny	Sunny	Sunny				
COMMENTS								

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.							
Project No.	22455							
Client	Marlet							
Date	16-Jun-20							
	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.1	2.5	1.63	1.63				
GAS FLOW	0.0l/hr	0l/hr	0l/hr	0l/hr				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.0	0.0	0.1	0.0				
O2(%)	20.7	19.9	20.4	20.6				
BAROMETRIC PRESURE (mb)	1001	1001	1001	1001				
WEATHER	Raining	Raining	Raining	Raining				
COMMENTS								

Appendix VII Site Plan

LEGEND

- TP (12No.)
- BH (4No.)
- IT (2No.)
- CBR (1No.)

NOTE: DRAWING TO BE READ IN CONJUNCTION WITH GROUND INVESTIGATION SCOPE OF WORKS

Borehole Schedule		
Ref	Position X	Position Y
BH-01	[illegible]	[illegible]
BH-02	[illegible]	[illegible]
BH-03	[illegible]	[illegible]
BH-04	[illegible]	[illegible]

Trial Pit Schedule		
Ref	Position X	Position Y
TP-01	[illegible]	[illegible]
TP-02	[illegible]	[illegible]
TP-03	[illegible]	[illegible]
TP-04	[illegible]	[illegible]
TP-05	[illegible]	[illegible]
TP-06	[illegible]	[illegible]
TP-07	[illegible]	[illegible]
TP-08	[illegible]	[illegible]
TP-09	[illegible]	[illegible]
TP-10	[illegible]	[illegible]
TP-11	[illegible]	[illegible]
TP-12	[illegible]	[illegible]

Infiltration Schedule		
Ref	Position X	Position Y
IT-01	[illegible]	[illegible]
IT-02	[illegible]	[illegible]

CBR Schedule		
Ref	Position X	Position Y
CBR-01	[illegible]	[illegible]

AECOM

PROJECT
Residental Development at Sandyford Avid Site

CLIENT
Marlet Property Group

CONSULTANT

AECOM
4th Floor, Adelphi Plaza, George's Street
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www.aecom.com

NOTES

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	18.02.2020	Issued for Tender

SUITABILITY STATUS
D2 - Suitable for Tender

PROJECT NUMBER
PR-461030

SHEET TITLE
Site Investigation Scope of Works

SHEET NUMBER
AVID-ACM-00-XX-DR-S-060001

SCALE: 1:500 REV: P01

D. Greenfield Run-off Rate Calculations for Proposed Site

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Laura Ruiz
Site name:	TACK SHD
Site location:	

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	
Longitude:	
Reference:	2810987889
Date:	Mar 10 2022 15:06

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.46

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	0	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.00	0.1

Hydrological characteristics	Default	Edited
SAAR (mm):	0	930
Hydrological region:	1	1
Growth curve factor 1 year:	-	0.85
Growth curve factor 30 years:	-	1.95
Growth curve factor 100 years:	-	2.48
Growth curve factor 200 years:	-	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0	0.11
1 in 1 year (l/s):		0.09
1 in 30 years (l/s):		0.21
1 in 100 year (l/s):		0.27
1 in 200 years (l/s):		0.31

E. Attenuation Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.800	Minimum Backdrop Height (m)	0.200
Ratio-R	0.274	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
3	0.025	4.00	85.470	1200	719353.583	726533.352	1.425
20			84.350	1200	719376.314	726575.258	1.600
19	0.025	4.00	84.430	1200	719370.802	726565.006	1.425
17	0.140	4.00	84.100	1200	719347.616	726586.027	1.580
16	0.056	4.00	84.100	1200	719354.578	726598.631	1.730
15			84.100	1200	719372.569	726584.828	2.320
14			84.250	1200	719379.482	726581.589	2.509
13			83.950	1200	719398.596	726617.105	2.478
5	0.072	4.00	84.100	1200	719376.194	726602.582	1.425
6			84.200	1200	719382.001	726577.750	1.419
7	0.059	4.00	83.990	1200	719398.173	726610.716	1.025
8	0.082	4.00	84.100	1200	719370.962	726590.817	2.080
9			84.100	1200	719369.445	726586.155	2.300
2			83.950	1200	719405.157	726615.358	2.523
1			84.250	1200	719420.522	726621.550	2.934

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2	2	1	16.673	0.600	81.427	81.316	0.111	150.0	225	6.19	1.0
13	13	2	6.791	0.600	81.472	81.427	0.045	150.0	225	5.93	1.0
14	14	13	40.334	0.600	81.741	81.472	0.269	150.0	225	5.82	1.0
15	15	14	7.704	0.600	81.780	81.741	0.039	200.0	225	5.19	1.0
16	16	8	18.260	0.600	82.370	82.020	0.350	52.2	225	4.35	50.0
17	17	16	14.469	0.600	82.520	82.370	0.150	96.5	225	4.18	50.0
5	5	8	12.876	0.600	82.675	82.458	0.217	59.3	225	4.13	50.0
3	3	19	36.034	0.600	84.045	83.005	1.040	34.6	225	4.27	50.0
8	8	9	4.903	0.600	82.020	81.800	0.220	22.3	225	4.38	50.0
9	9	15	3.394	0.600	81.800	81.780	0.020	169.7	225	5.05	1.0
19	19	20	11.640	0.600	83.005	82.750	0.255	45.6	225	4.37	50.0
7	7	6	36.719	0.600	82.965	82.781	0.184	200.0	225	4.66	50.0
6	6	20	6.209	0.600	82.781	82.750	0.031	200.0	225	4.78	50.0
20	20	9	12.881	0.600	82.750	82.674	0.076	169.5	225	4.99	50.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.800	Drain Down Time (mins)	240
Ratio-R	0.274	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	20	0	0

Node 14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.741	Product Number	CTL-SHE-0038-9000-2000-9000
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.9	Min Node Diameter (mm)	1200

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	81.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	210.0	0.0	2.000	210.0	0.0	2.001	0.0	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	3	10	84.088	0.043	7.1	0.0636	0.0000	OK
2880 minute winter	20	2700	83.029	0.279	1.3	0.3157	0.0000	SURCHARGED
15 minute winter	19	10	83.070	0.065	14.2	0.0963	0.0000	OK
2880 minute winter	17	2700	83.029	0.509	1.6	1.4782	0.0000	SURCHARGED
2880 minute winter	16	2700	83.029	0.659	2.2	1.1720	0.0000	SURCHARGED
2880 minute winter	15	2700	83.030	1.250	1.7	1.4141	0.0000	SURCHARGED
2880 minute winter	14	2760	83.032	1.291	1.4	1.4599	0.0000	SURCHARGED
2880 minute winter	13	2700	81.493	0.021	0.7	0.0240	0.0000	OK
2880 minute winter	5	2700	83.029	0.354	0.8	0.7583	0.0000	SURCHARGED
2880 minute winter	6	2700	83.029	0.248	0.7	0.2807	0.0000	SURCHARGED
15 minute summer	7	10	83.071	0.106	16.8	0.2420	0.0000	OK
2880 minute winter	8	2700	83.029	1.009	3.9	1.9366	0.0000	SURCHARGED
2880 minute winter	9	2700	83.029	1.229	5.3	259.5086	0.0000	SURCHARGED
2880 minute winter	2	2700	81.448	0.021	0.7	0.0237	0.0000	OK
2880 minute winter	1	2700	81.337	0.021	0.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	3	3	19	7.1	0.973	0.080	0.2657	
2880 minute winter	20	20	9	1.3	0.459	0.033	0.5123	
15 minute winter	19	19	20	14.2	0.802	0.184	0.2280	
2880 minute winter	17	17	16	1.6	0.594	0.030	0.5754	
2880 minute winter	16	16	8	2.2	0.629	0.030	0.7262	
2880 minute winter	15	15	14	1.4	0.137	0.039	0.3064	
2880 minute winter	14	Hydro-Brake®	13	0.7				
2880 minute winter	13	13	2	0.7	0.400	0.018	0.0126	
2880 minute winter	5	5	8	0.8	0.573	0.012	0.5121	
2880 minute winter	6	6	20	0.7	0.296	0.019	0.2469	
15 minute summer	7	7	6	16.9	0.800	0.461	0.8108	
2880 minute winter	8	8	9	4.4	0.984	0.040	0.1950	
2880 minute winter	9	9	15	1.7	0.269	0.041	0.1350	
2880 minute winter	2	2	1	0.7	0.407	0.018	0.0304	108.1

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	3	10	84.098	0.053	11.0	0.0790	0.0000	OK
4320 minute winter	20	4080	83.716	0.966	1.3	1.0920	0.0000	SURCHARGED
4320 minute winter	19	4080	83.716	0.710	0.6	1.0530	0.0000	SURCHARGED
4320 minute winter	17	4080	83.715	1.195	1.8	3.4704	0.0000	SURCHARGED
4320 minute winter	16	4080	83.716	1.346	2.5	2.3923	0.0000	SURCHARGED
4320 minute winter	15	4080	83.714	1.934	2.0	2.1873	0.0000	SURCHARGED
4320 minute winter	14	4080	83.712	1.971	1.7	2.2287	0.0000	SURCHARGED
4320 minute winter	13	4020	81.495	0.023	0.9	0.0263	0.0000	OK
4320 minute winter	5	4080	83.715	1.040	0.9	2.2275	0.0000	SURCHARGED
4320 minute winter	6	4080	83.716	0.935	0.7	1.0570	0.0000	SURCHARGED
4320 minute winter	7	4020	83.715	0.750	0.7	1.7123	0.0000	FLOOD RISK
4320 minute winter	8	4080	83.715	1.695	4.3	3.2536	0.0000	SURCHARGED
4320 minute winter	9	4080	83.715	1.915	6.1	404.4136	0.0000	SURCHARGED
4320 minute winter	2	4080	81.450	0.023	0.9	0.0259	0.0000	OK
4320 minute winter	1	4080	81.339	0.023	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	3	3	19	11.0	1.100	0.124	0.3636	
4320 minute winter	20	20	9	1.3	0.459	0.033	0.5123	
4320 minute winter	19	19	20	0.6	0.331	0.008	0.4629	
4320 minute winter	17	17	16	1.8	0.557	0.033	0.5754	
4320 minute winter	16	16	8	2.4	0.575	0.033	0.7262	
4320 minute winter	15	15	14	1.7	0.115	0.046	0.3064	
4320 minute winter	14	Hydro-Brake®	13	0.9				
4320 minute winter	13	13	2	0.9	0.422	0.021	0.0145	
4320 minute winter	5	5	8	0.9	0.550	0.013	0.5121	
4320 minute winter	6	6	20	0.7	0.299	0.019	0.2469	
4320 minute winter	7	7	6	0.7	0.363	0.019	1.4604	
4320 minute winter	8	8	9	5.6	0.930	0.051	0.1950	
4320 minute winter	9	9	15	2.0	0.302	0.050	0.1350	
4320 minute winter	2	2	1	0.9	0.430	0.021	0.0348	183.4

UK and Ireland Office Locations

Appendix B Drawings and Documents to Accompany the Feedback Form

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND SURFACE WATER

- SW MH3 / CL 84.250 / IL 81.128 — 225mmØ @ 1:200.0 → — INDICATES PROPOSED SURFACE WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- G — INDICATES PROPOSED ROAD GULLY AND 150mmø CONNECTION
- SWDP — PROPOSED 150mmø SURFACE WATER DOWN PIPE (BY OTHERS)
- SW MH30 / CL 84.100 / IL 83.500 — 225mmØ @ 1:200.0 → — INDICATES PROPOSED SURFACE WATER BASEMENT SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- G — INDICATES PROPOSED ROAD GULLY (PARKING AREAS ONLY), AND 150mmø CONNECTION
- SW MH30 / CL 84.100 / IL 83.500 — 225mmØ @ 1:200.0 → — INDICATES PROPOSED CAR PARK BASEMENT DRAINAGE SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- SWDP (TB) — INDICATES PROPOSED SURFACE WATER DOWN PIPE (TO BASEMENT)
- Ex. SW CL: 84.25 IL: 81.00 — EX 450ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES FUTURE FOOTPATH
- INDICATES FUTURE CYCLETRACK
- INDICATES FUTURE ROAD
- INDICATES FUTURE GRASS VERGE

LEGEND: LOWER GROUND

- INDICATES LEVEL 84.15m
- INDICATES LEVEL 84.45m
- INDICATES LEVEL 84.82m
- INDICATES LEVEL 84.87m
- INDICATES LEVEL 86.125m
- INDICATES LEVEL 86.615m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD SHD

TITLE PROPOSED SURFACE WATER DRAINAGE LAYOUT AT B1 LOWER GROUND LEVEL

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P120	

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND FOUL WATER

FW MH2
CL 84.000
IL 80.049
225mmØ @ 1:200.0 ←
INDICATES PROPOSED PUBLIC FOUL WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

F MH 1
CL 84.100
IL 83.100
ø225 →@ 1:43.2
INDICATES PROPOSED PRIVATE FOUL WASTE BASEMENT SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

F MH 1
CL 84.100
IL 83.100
ø225 →@ 1:43.2
INDICATES PROPOSED PRIVATE FOUL WASTE SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

FWDP
PROPOSED 150mmØ FOUL WASTE WATER DOWN PIPE (BY OTHERS)

Ex. FW
CL: 83.79
IL: 81.90
EX 225ø
FOUL → FOUL
INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

INDICATES FUTURE FOOTPATH

INDICATES FUTURE CYCLETRACK

INDICATES FUTURE ROAD

INDICATES FUTURE GRASS VERGE

LEGEND: LOWER GROUND

INDICATES LEVEL 84.15m

INDICATES LEVEL 84.45m

INDICATES LEVEL 84.82m

INDICATES LEVEL 84.87m

INDICATES LEVEL 86.125m

INDICATES LEVEL 86.615m

Ex. FW
CL: 84.10
IL: 81.23

F MH 12
CL 84.300
IL 81.535

ø225 ←@ 1:55.5

F MH 11
CL 84.000
IL 81.848

EX 225ø

Ex. FW
CL: 83.92
IL: 82.01

Ex. FW
CL: 83.79
IL: 81.90

F MH 10
CL 83.980
IL 81.889

ø225 →@ 1:80.4

ø225 →@ 1:180.0

F MH 8
CL 84.150
IL 82.370

ø225 →@ 1:109.7

ø225 →@ 1:108.6

F MH 9
CL 84.175
IL 82.050

F MH 6
CL 84.150
IL 82.520

BASEMENT OUTLINE

RISING MAIN FROM BASEMENT

F MH 3 S/O
CL 84.100
IL 82.750

F MH 4
CL 84.420
IL 82.183

ø225 →@ 1:200.0

F MH 1
CL 84.100
IL 83.100

ø225 →@ 1:44.2

F MH 2
CL 85.200
IL 82.367

1 April 2022 11:04 - - DRAFT - - Laura Ruiz Garrido

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

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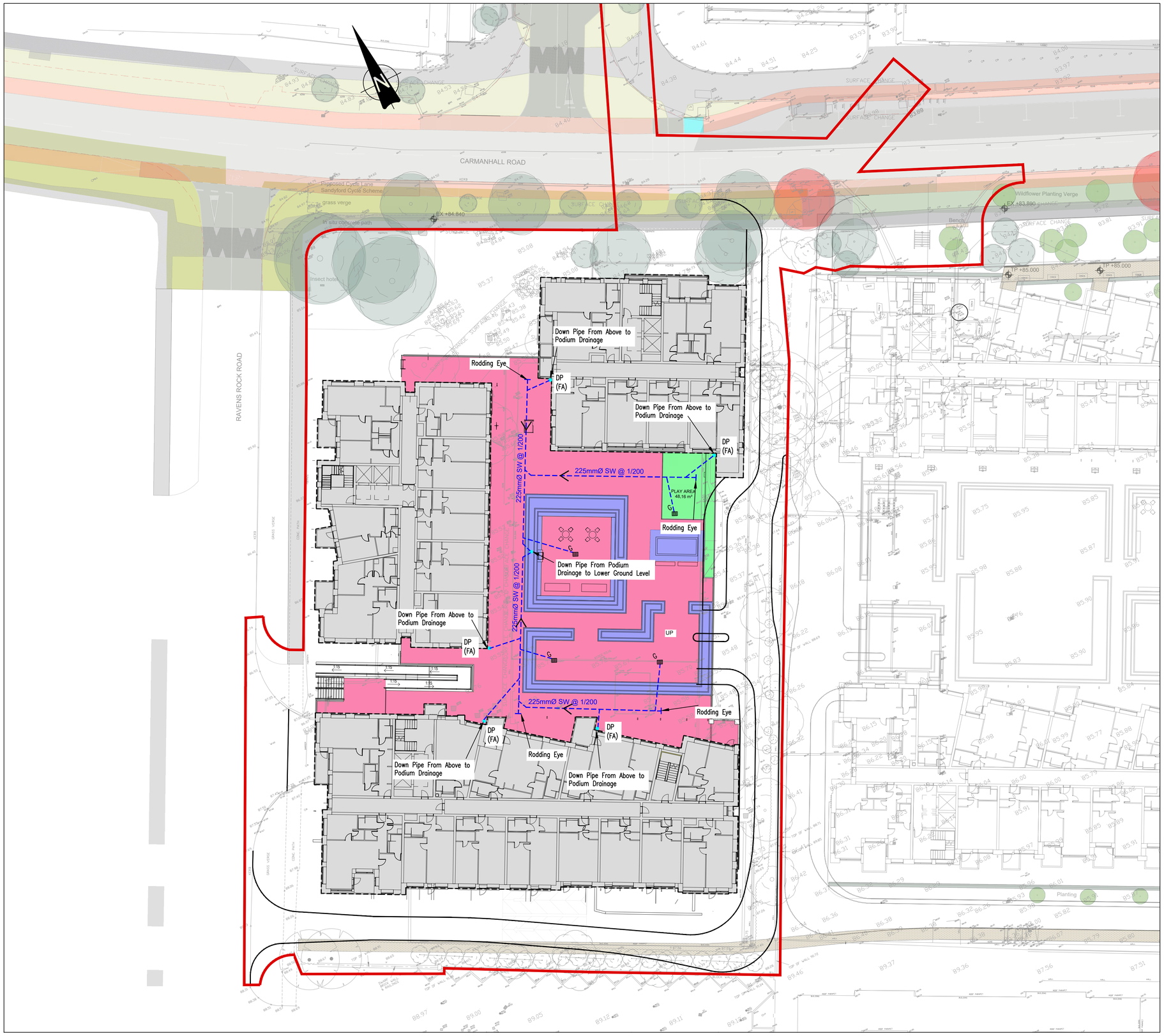
CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD SHD

TITLE PROPOSED FOUL WATER DRAINAGE LAYOUT AT B1 LOWER GROUND LEVEL

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P121	



PLAN VIEW – PROPOSED SURFACE WATER DRAINAGE LAYOUT AT PODIUM LEVEL

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND : PODIUM DRAINAGE

225mmØ SW @ 1/200	INDICATES SLUNG SURFACE WATER DRAINAGE
G	INDICATES PODIUM GULLY WITH 150mm CONNECTION
DP (FA)	INDICATES DOWN PIPE FROM ABOVE WITH CONNECTION

LEGEND : PODIUM

	INDICATES LEVEL 88.50m
	INDICATES LEVEL 89.00m
	INDICATES LEVEL 89.60m
	INDICATES APARTMENT LEVEL (LEVELS VARY)

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100
09:57
1 April 2022
- - DRAFT - -
Laura Ruiz Garrido

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
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CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD SHD

TITLE PROPOSED SURFACE WATER DRAINAGE LAYOUT AT PODIUM LEVEL

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P122	

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

FB MH1 CL 81.60 IL 80.85 150mmø @1:100	PROPOSED CAR PARK BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER & INVERT LEVEL
G	PROPOSED GULLY & CONNECTION
SWDP (FA)	PROPOSED DOWNPIPE (FROM ABOVE) AND CONNECTION

CARMANHALL ROAD

RAVENS ROCK ROAD

BUILDING ABOVE

BUILDING ABOVE

FB MH2
CL 81.60
IL 80.85

KLARGESTER
NSBP003
BY PASS
PETROL
INTERCEPTOR
OR SIMILAR
APPROVED

PUMPING
STATION

RISING
MAIN

SWDP
(FA)

SWDP
(FA)

150ø @1:100

150ø @1:100

150ø @1:100

FFL
81.60

FB MH3
CL 81.60
IL 80.73

IL 80.45

FB MH1
CL 81.60
IL 80.85

UP

ACO

BUILDING ABOVE

1 April 2022

10:53

- - DRAFT - -

Laura Ruiz Garrido

1:250 0 5.0 10.0 15.0 20.0 25.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants

BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD
ARCHITECT	MC CAULEY DAYE O'CONNELL
PROJECT	TACK SANDYFORD SHD
TITLE	PROPOSED DRAINAGE LAYOUT AT B2 BASEMENT LEVEL

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P123	

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

LEGEND FOUL AND SURFACE WATER

- INDICATES PROPOSED PUBLIC FOUL WATER SEWER AND MANHOLE.
- INDICATES PROPOSED PRIVATE FOUL WASTE BASEMENT SEWER AND MANHOLE
- INDICATES PROPOSED PRIVATE FOUL WASTE SEWER AND MANHOLE
- INDICATES PROPOSED BASEMENT SURFACE WATER SEWER AND MANHOLE
- INDICATES PROPOSED SURFACE WATER SEWER AND MANHOLE
- INDICATES PROPOSED CAR PARK BASEMENT DRAINAGE SEWER AND MANHOLE
- Ex. FW CL: 83.79 IL: 81.90 — INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- Ex. SW CL: 84.25 IL: 81.00 — EX 450ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES FUTURE FOOTPATH
- INDICATES FUTURE CYCLETRACK
- INDICATES FUTURE ROAD
- INDICATES FUTURE GRASS VERGE

LEGEND: LOWER GROUND

- INDICATES LEVEL 84.15m
- INDICATES LEVEL 84.45m
- INDICATES LEVEL 84.82m
- INDICATES LEVEL 84.87m
- INDICATES LEVEL 86.125m
- INDICATES LEVEL 86.615m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

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CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD SHD

TITLE PROPOSED FOUL & SURFACE WATER DRAINAGE LAYOUT AT B1 LOWER GROUND LEVEL

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE 1:250 @A1	JOB NO. 21-118	DRG. NO. P124	REVISION

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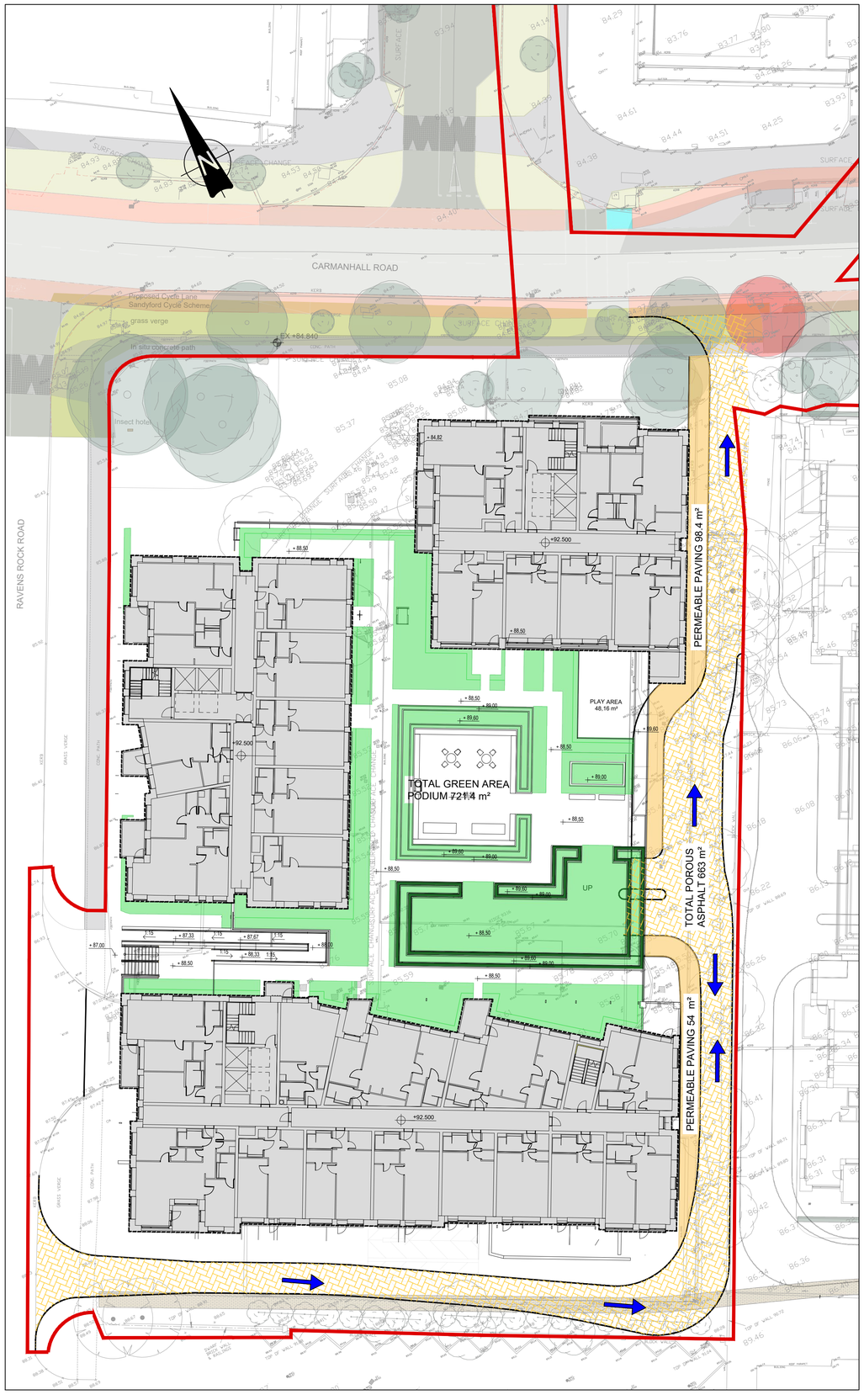
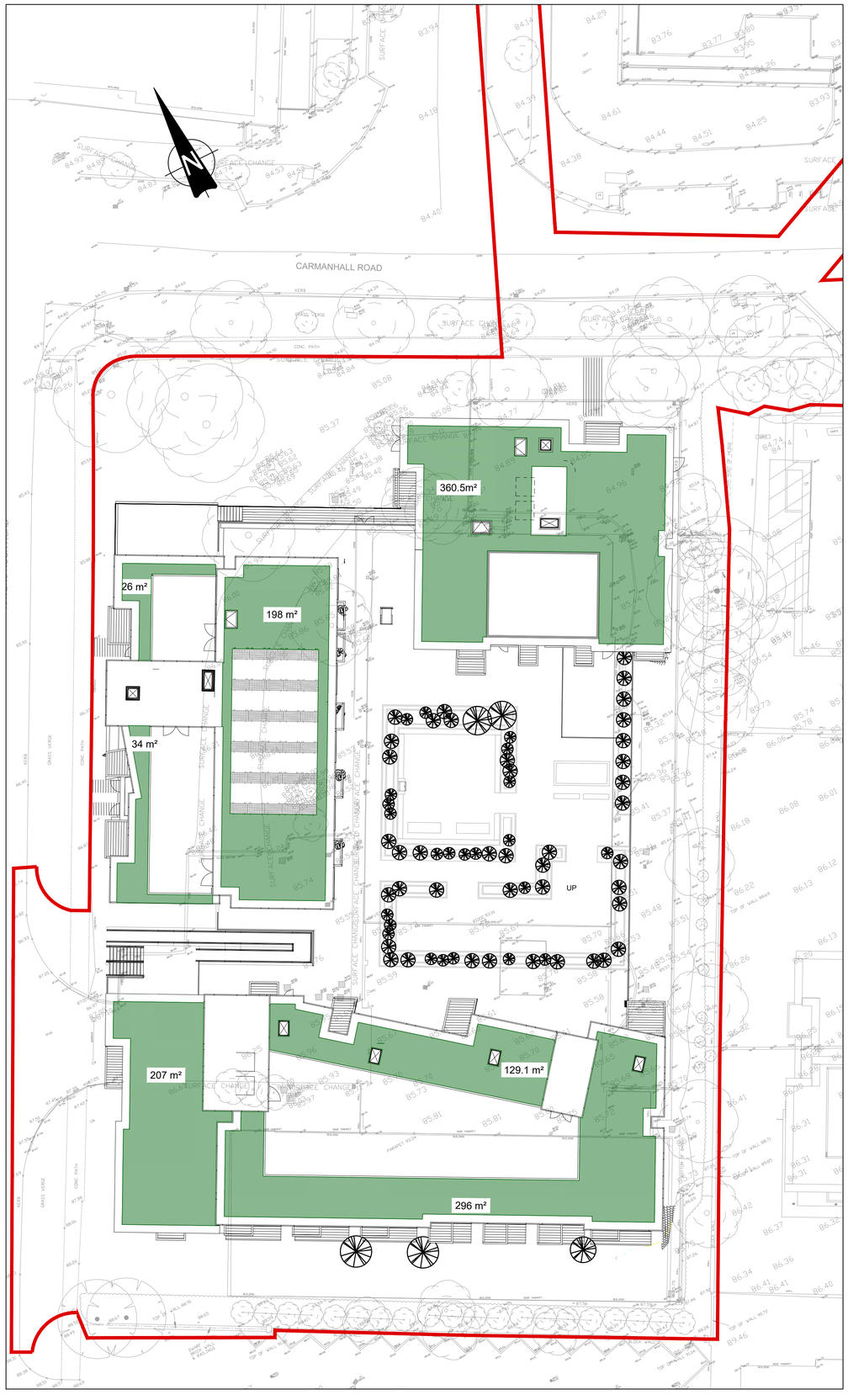
1:1 0 10 20 30 40 50 60 70 80 90 100

1 April 2022 10:58 -- DRAFT -- Laura Ruiz Garrido



PLAN VIEW – PROPOSED SUDS MEASURES AT PODIUM LEVEL



PLAN VIEW – PROPOSED SUDS MEASURES AT ROOF LEVEL

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

SUDS LEGEND : ROOF

- INDICATES PROPOSED GREEN ROOF
- 198 m² — INDICATES AREA OF GREEN ROOF / CONTRIBUTING TO INTERCEPTION STORAGE
- INDICATES PLANNING APPLICATION BOUNDARY

SUDS LEGEND: PODIUM

- INDICATES PROPOSED PODIUM GREEN ROOF
- 721.4 m² — INDICATES AREA OF GREEN ROOF / CONTRIBUTING TO INTERCEPTION STORAGE
- INDICATES PROPOSED POROUS ASPHALT
- INDICATES OVERLAND DRAINAGE FLOW ROUTES
- INDICATES PLANNING APPLICATION BOUNDARY
- INDICATES PROPOSED PERMEABLE PAVING

Table 7 Interception Storage Provided

Area	Total Hardstanding Area m2	Interception mechanism	Interception Area m2	green roof %	Percentage Benefiting %
Roof Blocks A-B-C	2079.9	Green Roof	1250.7	60.1	60.1
Podium Level	1592.2	Green podium	1592.2	N/A	100.0
Main Road and Footpaths	887.5	POROUS ASPHALT paving	663.0	N/A	91.8
		Permeable paving footpaths	152.0	N/A	
TOTAL	4559.6		3657.9	N/A	80.2

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

1 April 2022 11:30 - - DRAFT - - Laura Ruiz Garrido

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

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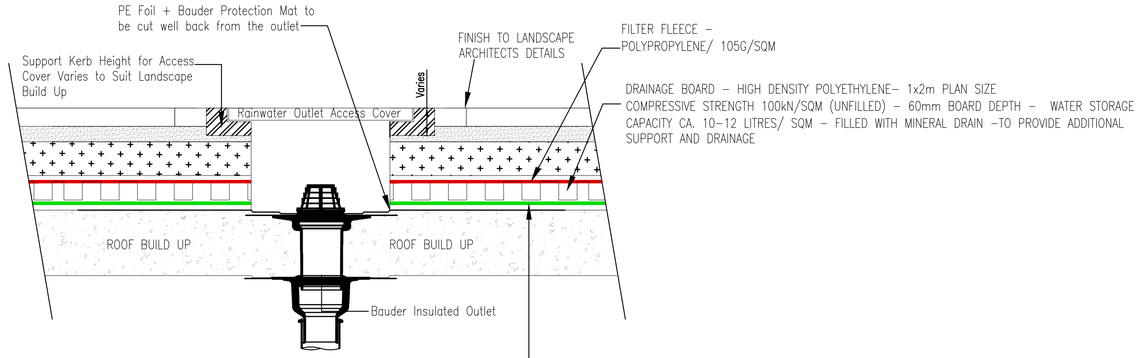
CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD
ARCHITECT MC CAULEY DAYE O'CONNELL
PROJECT TACK SANDYFORD SHD
TITLE SUDS MEASURES AND OVERLAND FLOOD ROUTE

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE 1:250 @A1	JOB NO. 21-118	DRG. NO. P125	REVISION

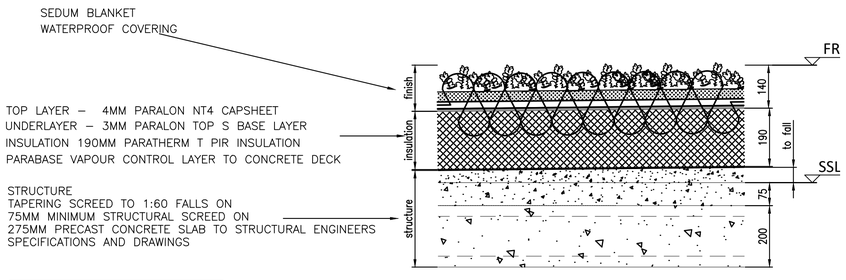
NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



TYPICAL OUTLET ON PODIUM

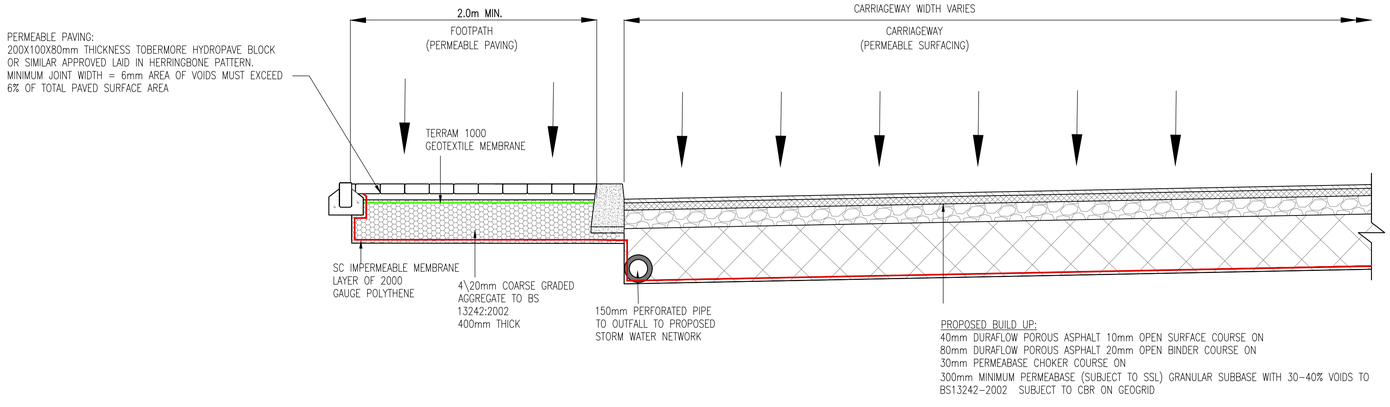
SCALE 1:10 @A1



U–VALUE TO BE ACHIEVED 0.12 W/m²K

TYPICAL SECTION THROUGH GREEN ROOF

SCALE 1:10



CROSS SECTION THROUGH PERMEABLE SURFACING

SCALE 1:25

1 April 2022 11:38 -- DRAFT -- Laura Ruiz Garrido

1:10 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0m
1:1 0 10 20 30 40 50 60 70 80 90 100m

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

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Email: info@waterman-moylan.ie www.waterman-moylan.ie

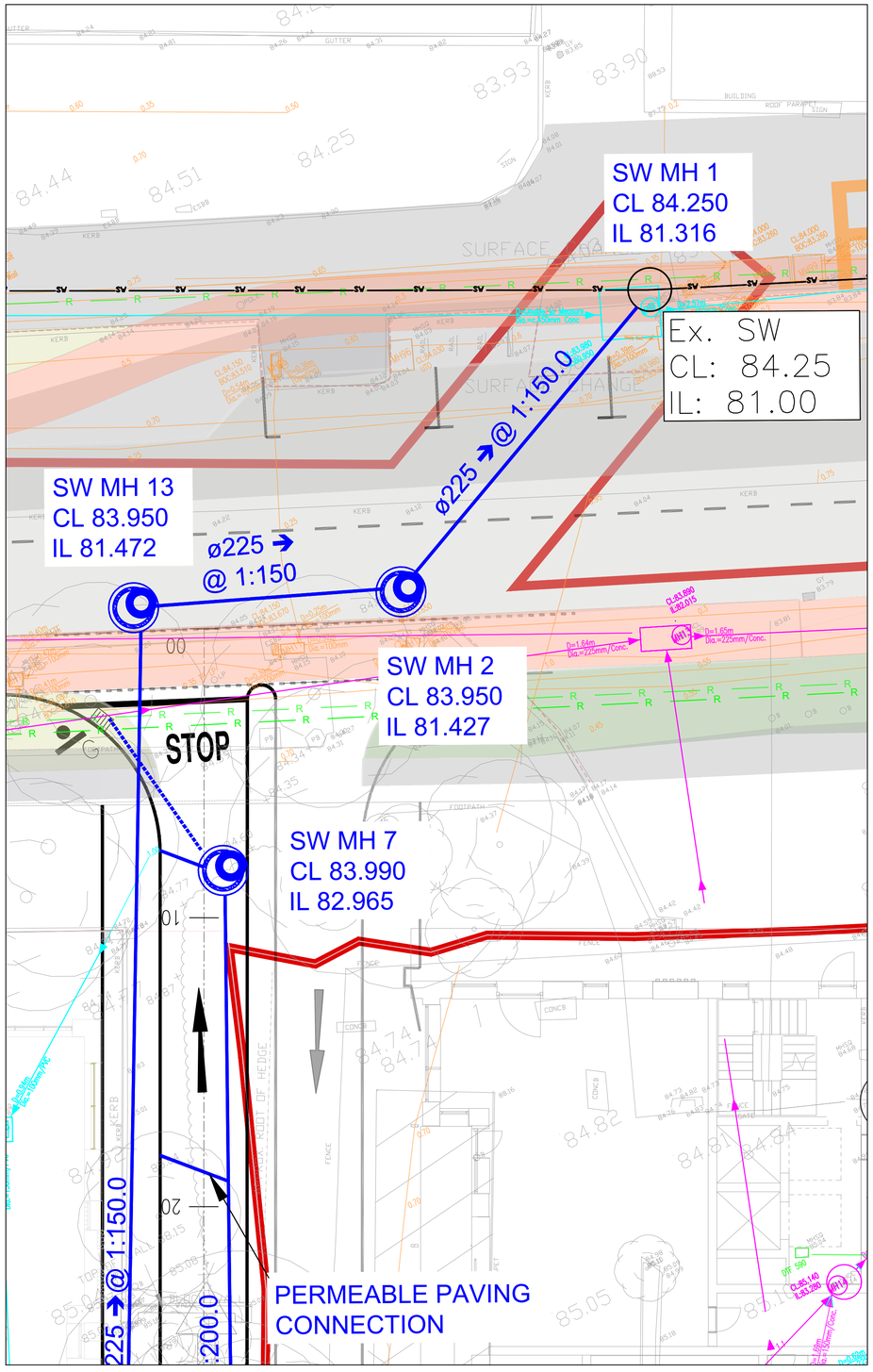
CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

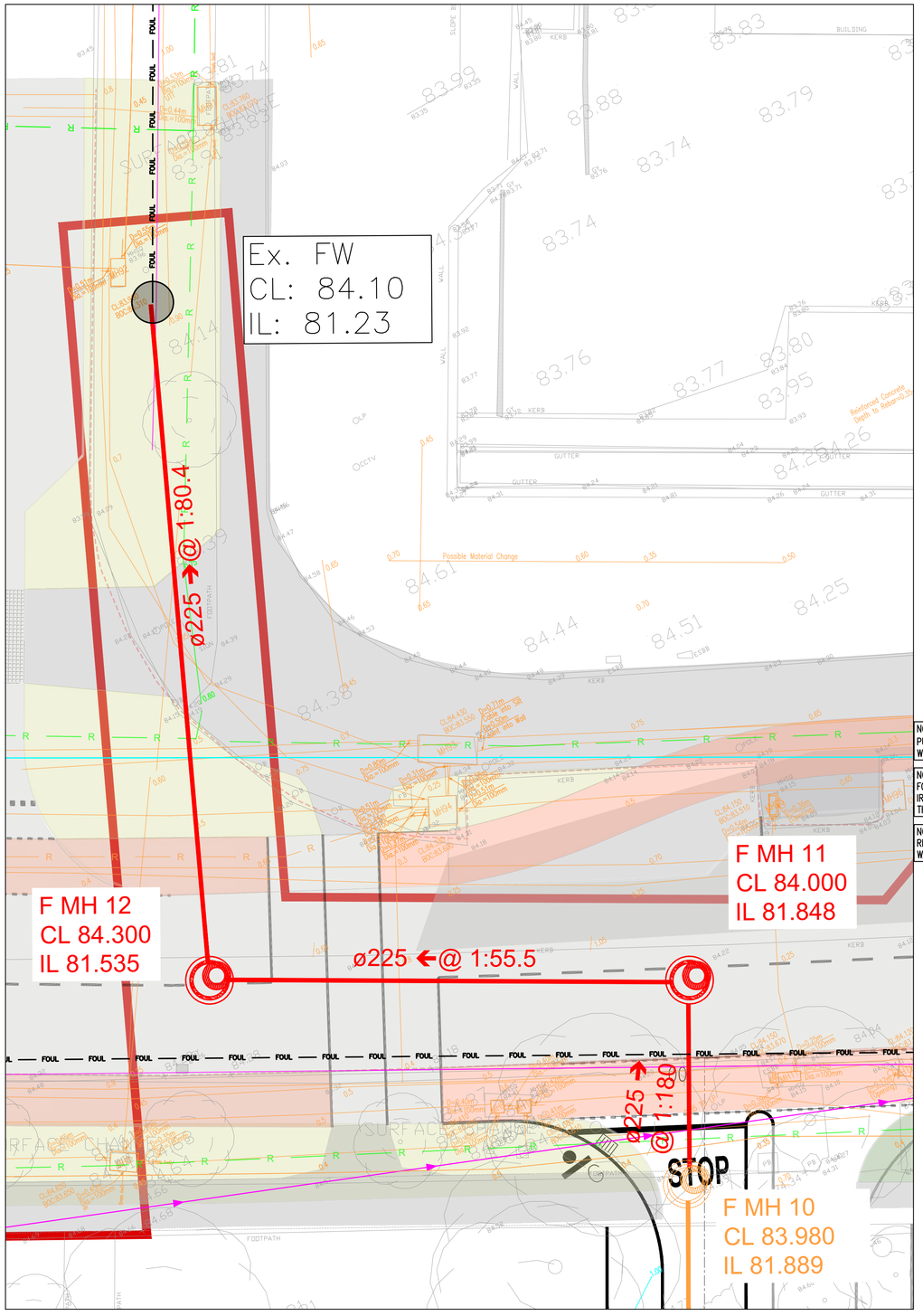
PROJECT TACK SANDYFORD SHD

TITLE SUDS DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	21–118	P126	



PLAN VIEW – PROPOSED SURFACE WATER OUTFALL



PLAN VIEW – PROPOSED FOUL WATER OUTFALL

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND FOUL AND SURFACE WATER

- INDICATES PROPOSED PUBLIC FOUL WATER SEWER AND MANHOLE.
- Ex. FW CL: 83.79 IL: 81.90 — EX 225ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES PROPOSED SURFACE WATER SEWER AND MANHOLE
- Ex. SW CL: 84.25 IL: 81.00 — EX 450ø — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- CL:83.980 IL:80.950 — INDICATES EXISTING SURFACE WATER
- INDICATES EXISTING FOUL WATER
- INDICATES EXISTING WATER SUPPLY
- INDICATES EXISTING UTILITIES

1 April 2022 11:17 - - DRAFT - - Laura Ruiz Garrido

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

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Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD
ARCHITECT MC CAULEY DAYE O'CONNELL
PROJECT TACK SANDYFORD SHD
TITLE PROPOSED FOUL & SURFACE WATER DRAINAGE OUTFALLS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:100 @A1	21-118	P128	

Outlet Size 'B'	Inlet Size 'A'	Fall across unit	Approx Empty Weight (kgs)	Dim L (mm)	Nominal Flow	Unit Ref No
Ø300 mm	Ø300 mm	100	180	1700	3 L/s	NSBP003

Notes:–

1. Inlet/Outlet pipes are plain pipe standard EN 858 states minimum connection sizes, units ordered with different sized connections are not fully compliant with the standard.

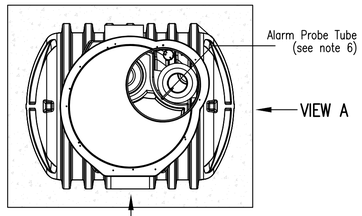
2. Extension necks for deeper inverts can be provided. These can be cut in 200 mm sections. Max 2.0m Invert recommended. Please ask our sales department for further details.

3. All units require appropriate cover and frame to suit applied loadings.

4. This drawing should be used for dimensional information only.It is essential that this drawing is read in conjunction with the installation guidelines from the supplier. 76 mm tube (internal) is supplied to house an oil alarm probe.

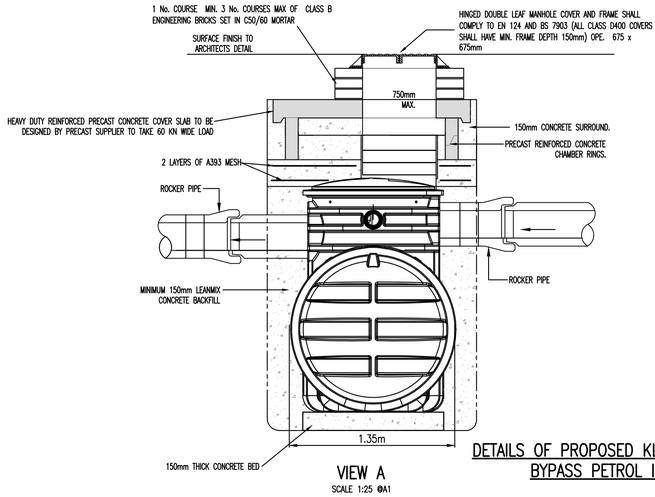
5. Wet site conditions – Concrete Backfill Dry site conditions – Pea Shingle Backfill

6. A ø 76 mm tube (internal) is supplied to house an oil alarm probe.

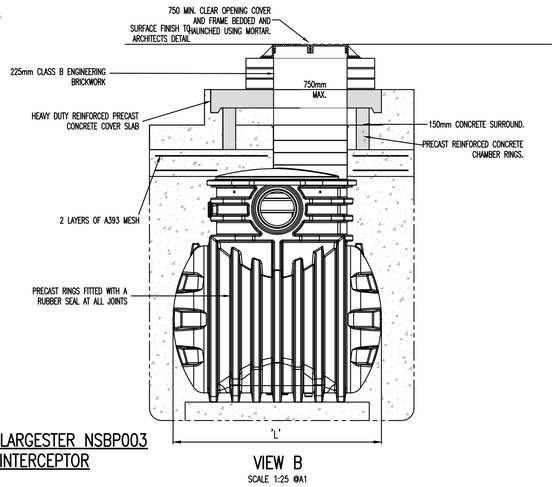


VIEW B

PLAN VIEW
SCALE 1:25 @A1

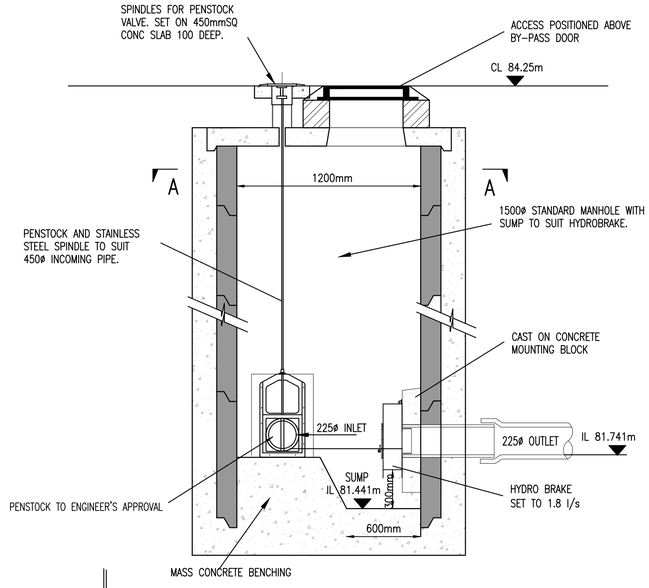


VIEW A
SCALE 1:25 @A1

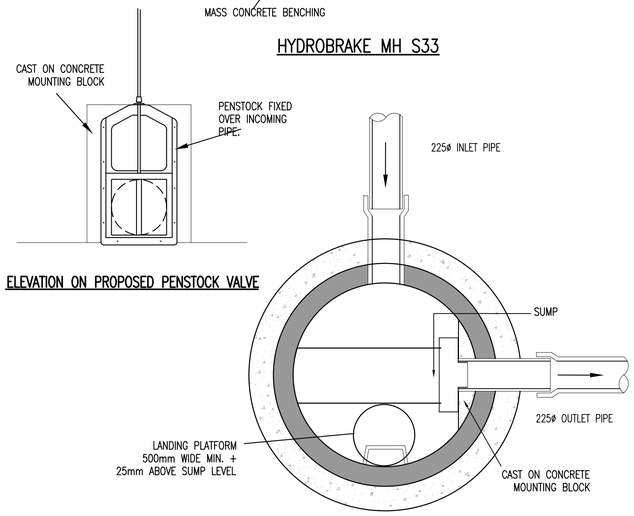


VIEW B
SCALE 1:25 @A1

DETAILS OF PROPOSED KLARGESTER NSBP003 BYPASS PETROL INTERCEPTOR

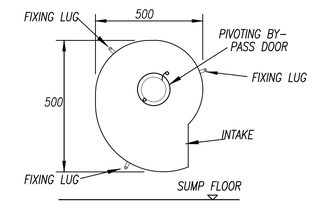


HYDROBRAKE MH S33



ELEVATION ON PROPOSED PENSTOCK VALVE

SECTION A – A



HYDRO BRAKE DETAIL
N.T.S

1 April 2022 10:23
- - DRAFT - -
Laura Ruiz Garrido

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
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Email: info@waterman-moylan.ie www.waterman-moylan.ie

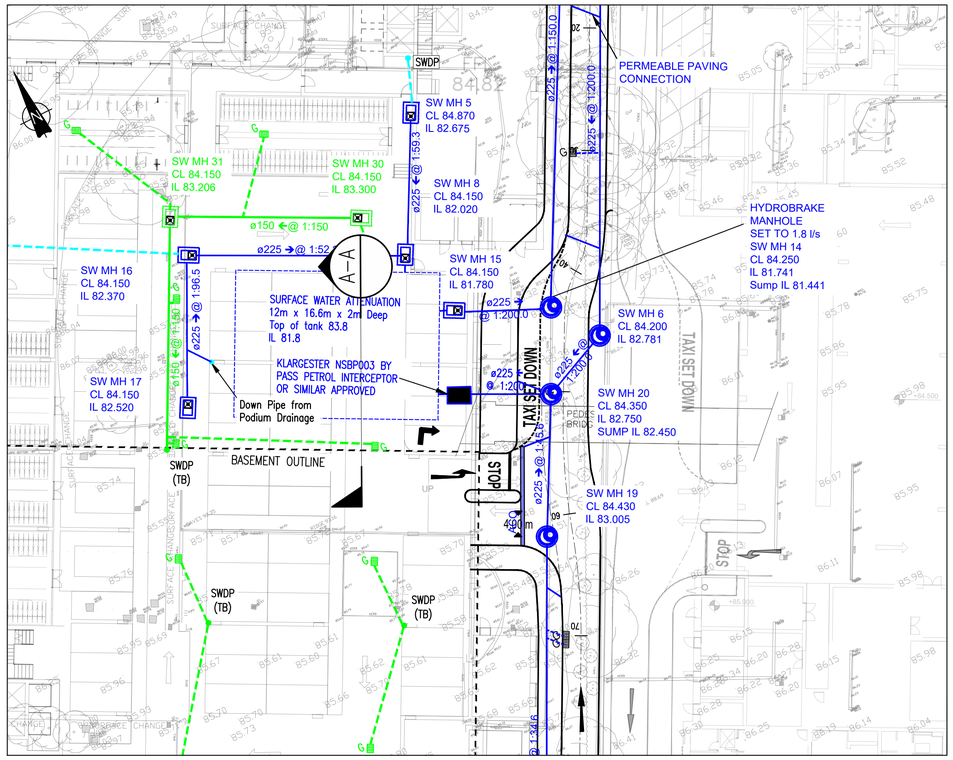
CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT TACK SANDYFORD SHD

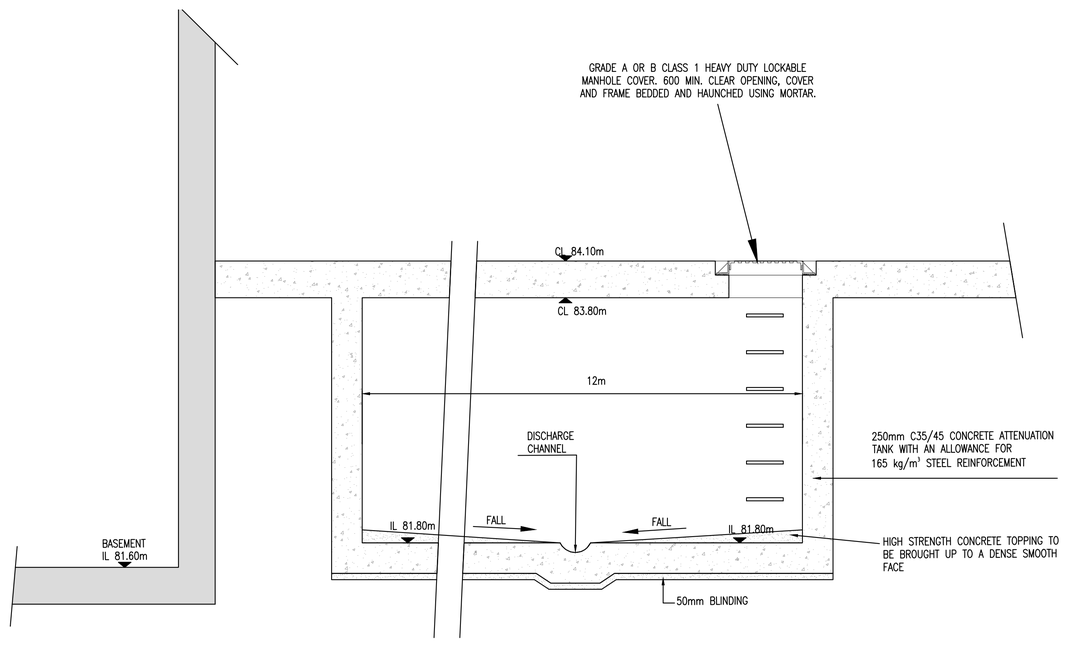
TITLE HYDROBRAKE AND PETROL INTERCEPTOR DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	21–118	P136	



PLAN VIEW – SURFACE WATER ATTENUATION LAYOUT

SCALE 1:500 @A1



SECTION A–A
ATTENUATION TANK CROSS-SECTION

SCALE 1:25 @A1

1 April 2022 11:23
-- DRAFT --
Laura Ruiz Garrido

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
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LEGEND SURFACE WATER

SW MH3
CL 84.250
IL 81.128
225mmØ @ 1:200.0 → INDICATES PROPOSED SURFACE WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

G INDICATES PROPOSED ROAD GULLY AND 150mmø CONNECTION

SW MH30
CL 84.100
IL 83.500
225mmØ @ 1:200.0 → INDICATES PROPOSED SURFACE WATER BASEMENT SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

G INDICATES PROPOSED ROAD GULLY (PARKING AREAS ONLY), AND 150mmø CONNECTION

SW MH30
CL 84.100
IL 83.500
225mmØ @ 1:200.0 → INDICATES PROPOSED CAR PARK BASEMENT DRAINAGE SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

INDICATES PROPOSED SURFACE WATER DOWN PIPE (TO BASEMENT)

SWDP
(TB)
PROPOSED 150mmø SURFACE WATER DOWN PIPE (BY OTHERS)

Ex. SW
CL: 84.25
IL: 81.00
EX 450ø INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

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DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT MC CAULEY DAYE O'CONNELL

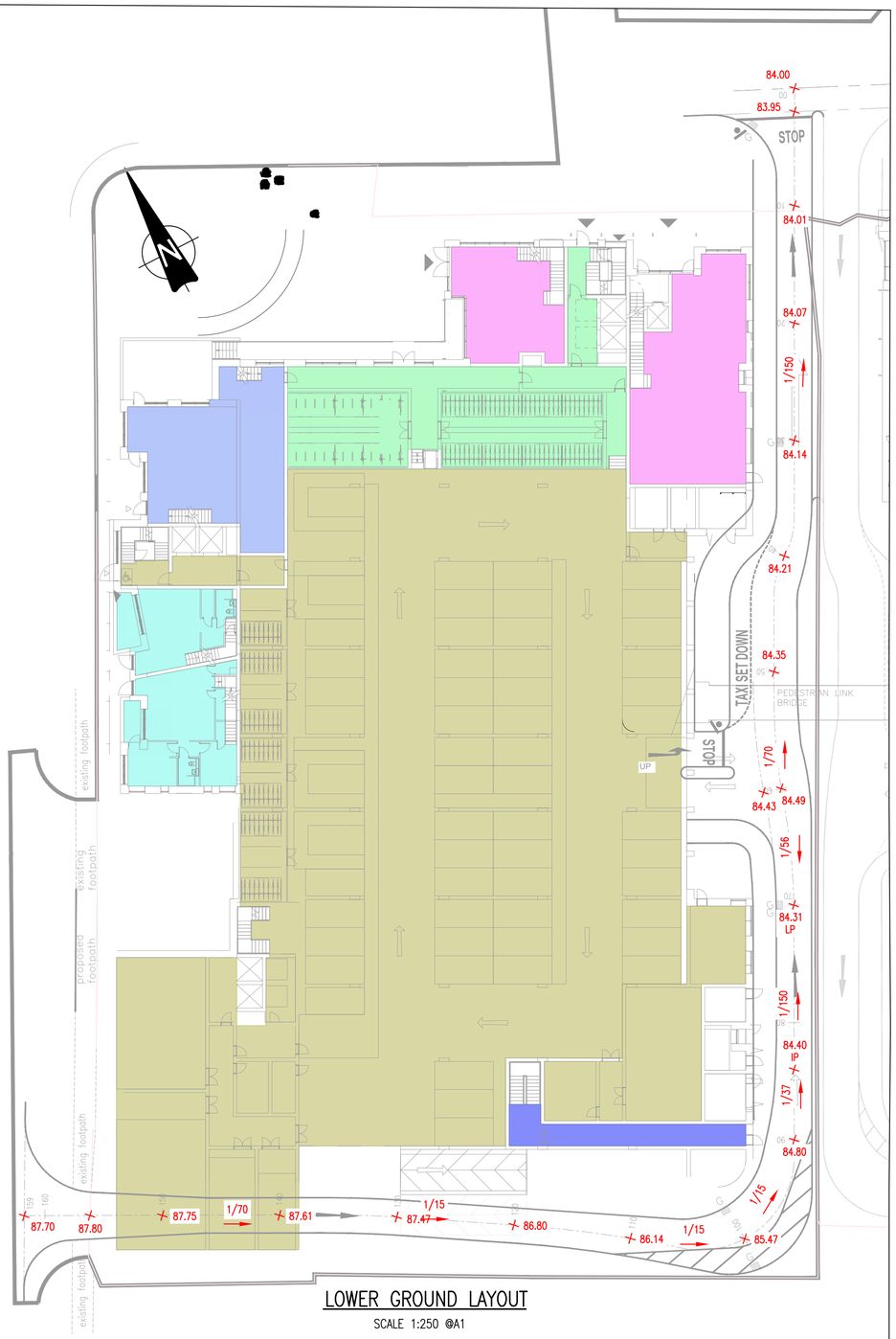
PROJECT TACK SANDYFORD SHD

TITLE PROPOSED SURFACE WATER ATTENUATION DETAILS

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P137	

PODIUM LAYOUT

SCALE 1:250 @A1



LOWER GROUND LAYOUT

SCALE 1:250 @A1

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
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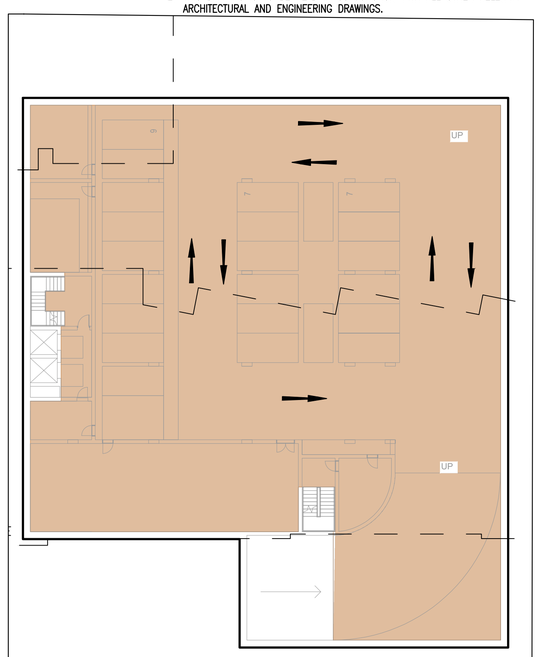

BASEMENT LAYOUT

SCALE 1:250 @A1

LEGEND : BASEMENT

INDICATES LEVEL 81.60m

LEGEND : PODIUM

- INDICATES LEVEL 88.50m
- INDICATES LEVEL 89.00m
- INDICATES LEVEL 89.60m
- INDICATES APARTMENT LEVEL (LEVELS VARY)

LEGEND: LOWER GROUND

- INDICATES LEVEL 84.15m
- INDICATES LEVEL 84.45m
- INDICATES LEVEL 84.82m
- INDICATES LEVEL 84.87m
- INDICATES LEVEL 86.125m
- INDICATES LEVEL 86.615m

1 April 2022 10:28 -- DRAFT -- Laura Ruiz Garrido

1:250 0 5.0 10.0 15.0 20.0 25.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

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Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD
ARCHITECT	MC CAULEY DAYE O'CONNELL
PROJECT	TACK SANDYFORD SHD
TITLE	PROPOSED BUILDINGS LEVELS LAYOUT

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P190	

Waterman Moylan
Engineering Consultants




Tack Sandyford SHD

Flood Risk Assessment

February 2022

Waterman Moylan Consulting Engineers Limited
Block S, East Point Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

Waterman Moylan
Engineering Consultants

Client Name: Sandyford Environmental Construction Ltd
Document Reference: 21-118r.061
Project Number: 21-118

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
Draft 3	14 March 2022	Brian McCann	Ian Worrell	

Comments

Waterman Moylan
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Content

Figures

Tables

1. Introduction

This Preliminary Flood Risk Assessment (FRA) has been prepared by Waterman Moylan on behalf of Sandyford Environmental Construction Ltd to accompany an SHD application to An Bord Pleanala (ABP) for a residential development on a brownfield site at the junction of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. See Figure 1.

This PFRA has been carried out in accordance with the Department of Housing and Local Government (DEHLG) and the Office of Public Works (OPW) document *"The Planning Process and Flood Risk Management Guidelines for Planning Authorities"* published in November 2009. This Assessment identifies and sets out possible mitigation measures against potential risks of flooding from various sources. Sources of possible flooding include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical error.

This report provides an assessment of the subject site for flood risk purposes only.

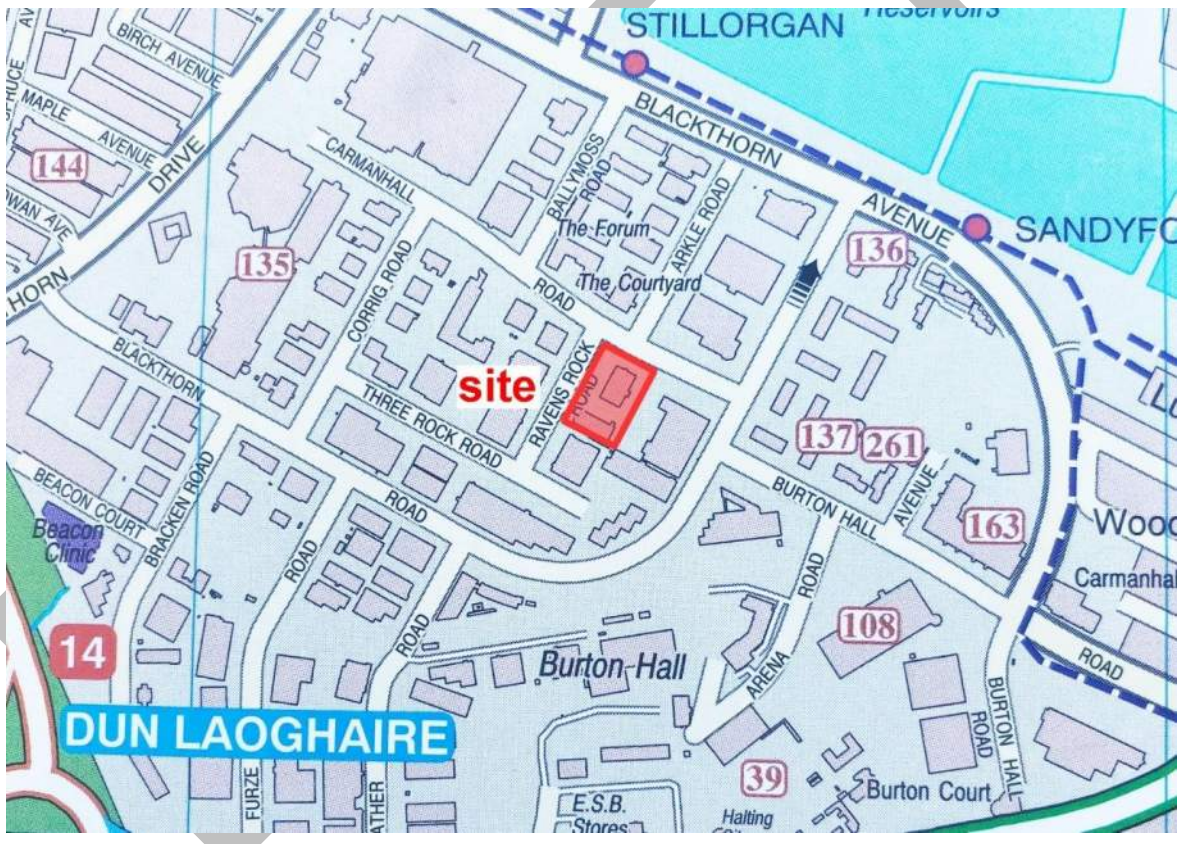

Figure 1 Location Map

2. Site Description

2.1 Site Location

The subject site is located at Sandyford in south County Dublin at the junction of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. The existing access to the site is from Ravens Rock Road. See Figure 1.

The site has an area of 0.57ha (1.4 acre) but for the purpose of encompassing the proposed access junctions, services connections and landscaping, the area within the red line for the planning application has been extended to 0.7ha.

The site was formerly occupied by Tack Packaging but at the time of writing in February 2022, the site was unoccupied save for a number of empty buildings.

The site falls from southwest to northeast ranging in level from 88.0mOD in the southwest to 84.0mOD in the northeast.

The adjoining site to the east at the junction of Carmanhall Road and Blackthorn Road is the location for a concurrent development and was formerly occupied by Avid Technology. It extends to 0.81 ha ((2.0 acre). See Figure 2.

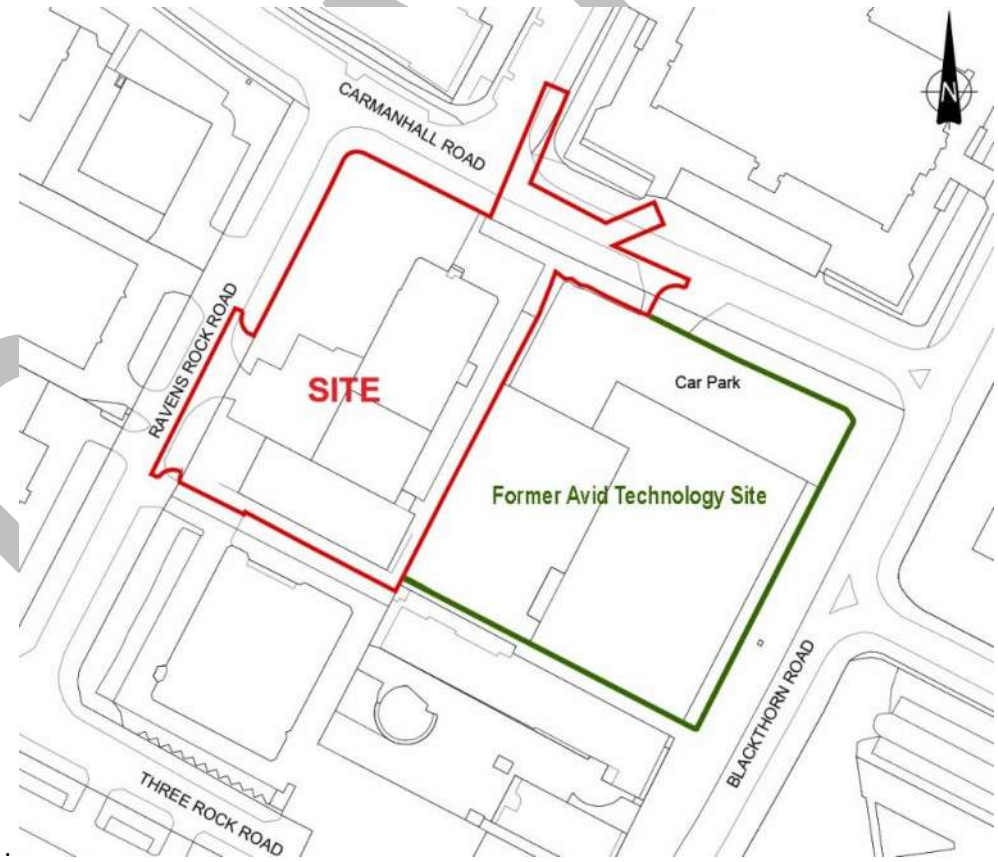

Figure 2 Existing Site Layout

2.2 Proposed Development

The proposed development will comprise some 207 Build-to-Rent residential units. See Figure 3.

Car parking with a total of 79 car spaces will be provided at Lower Ground Level and Basement. Cycle parking with 288 spaces will be provided at Lower Ground Level. Access is proposed from Ravens Rock Road with egress onto Carmanhall Road.

The public realm around the site will incorporate an upgrade of the pedestrian and cycle environment.

The development includes all associated infrastructure to service the development including access junctions, footpaths and cycle paths together with a network of watermains, foul water drains and surface water drains.

A concurrent development with its own Flood Risk Assessment on the former Avid Technology site to the east will comprise 336 Build-to-Rent residential units and 118 car parking spaces at Lower Ground Level and Basement. Access will be from Carmanhall Road and egress onto Blackthorn Road.

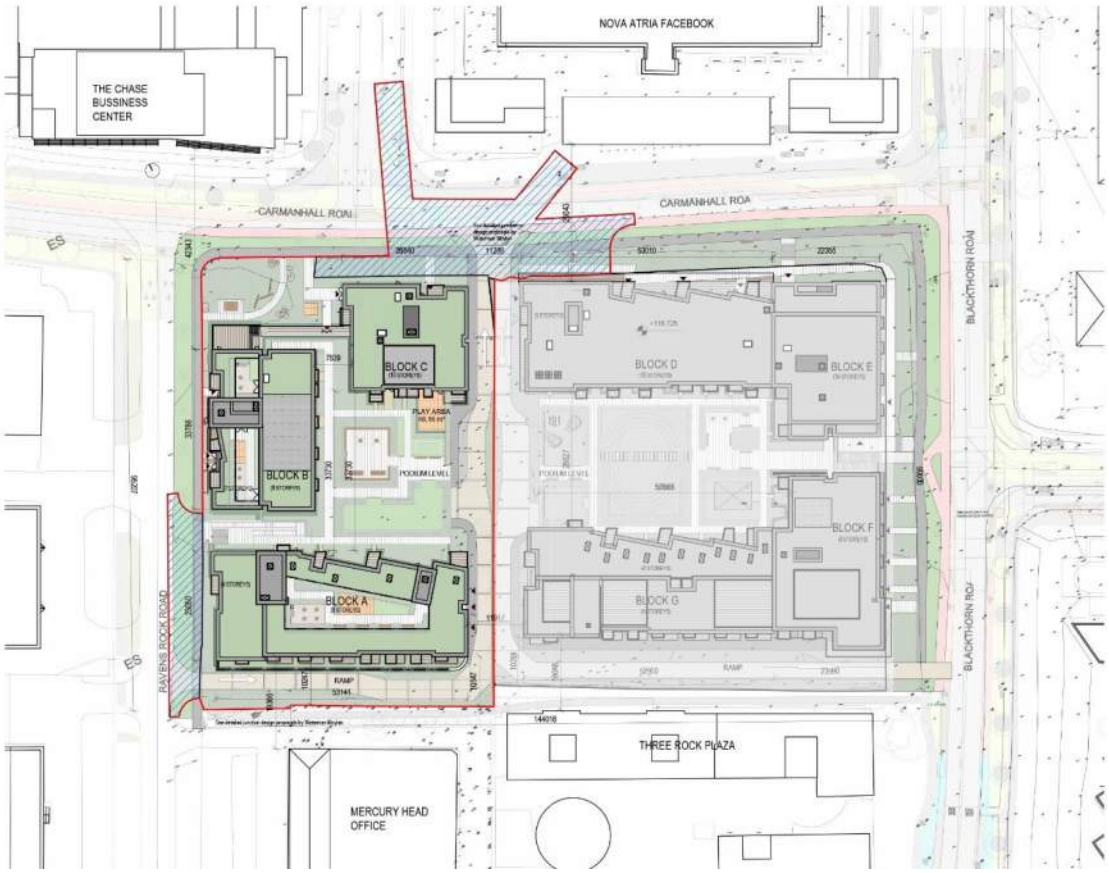

Figure 3 Proposed Site Layout

2.3 Proposed Floor Levels

The proposed floor levels for Blocks A, B and C on the former Tack Packaging site are set out in Table 1.

Table 1 Schedule of Floor Levels

Block	Basement	Lower Ground	Podium
A	81.60	84.15	88.50
B	81.60	84.15	88.50
C	-	84.15	88.50

2.4 Proposed Road and Street Levels

The proposed levels at the access and internal roads within the site are presented in Table 2.

Table 2 Proposed Road and Street Levels

Location	Function	Level
Ravens Rock Road	Entrance	87.70 mOD
Site	Inner Street	84.00 – 84.80 m OD
Carmanhall Road	Exit	83.95 mOD

2.5 Construction Program

At the time of writing in February 2022, it is likely that construction of the proposed development could commence in 2023 for completion in 2026

3. Flood Risk

3.1 Introduction

The components to be considered in the identification and assessment of flood risk are set out in Table A1 of the DEHLG/OPW guidelines on the Planning Process and Flood Risk Management and are summarised below:

- Tidal – flooding from high sea levels.
- Fluvial – flooding from water courses.
- Pluvial – flooding from rainfall / surface water.
- Ground Water – flooding from springs / raised ground water and
- Human/mechanical error – flooding due to human or mechanical error.

Each component will be investigated from a source, pathway and receptor perspective and the likelihood of flood occurring and the possible consequences will be assessed.

The likelihood of flooding falls into three categories; low, moderate and high, as described in the OPW Guidelines and set out in Table 1.

Table 3 OPW Guidelines

Likelihood	Low	Moderate	High
Tidal	Where probability < 0.1 % chance of occurring in a year	0.5 % chance of occurring in a year > probability > 0.1 % chance of occurring in a year	Where probability > 0.5 % chance of occurring in a year
Fluvial	Where probability < 0.1 % chance of occurring in a year	1 % chance of occurring in a year > probability > 0.1 % chance of occurring in a year	Where probability > 1 % chance of occurring in a year
Pluvial	Where probability < 0.1 % chance of occurring in a year	1 % chance of occurring in a year > probability > 0.1 % chance of occurring in a year	Where probability > 1 % chance of occurring in a year

For ground water and human/mechanical error, the limits of probability are not defined and therefore professional judgment is used. However, the likelihood of flooding is still categorised as low, moderate and high for these components. The likelihood and possible consequence of each event is considered, and the risk is evaluated. Risks will be mitigated where possible and the residual risks will then be considered as part of this assessment.

This report has considered the Eastern Catchment Flood Risk Assessment & Management (CFRAM) Study and maps prepared by RPS Group Ireland for the OPW. In addition, the Strategic Flood Risk

Assessment (SFRA) prepared as part of the Dun Laoghaire Rathdown County Development Plan 2016-2022 has been considered.

3.2 Tidal – Irish Sea

Source

The subject site is located in the catchment of the Carysfort Maretimo Stream as illustrated in Figure 4. The Carysfort Maretimo Stream discharges into the Irish Sea in Blackrock where the highest tide level is 4.5 metres OD (Malin).

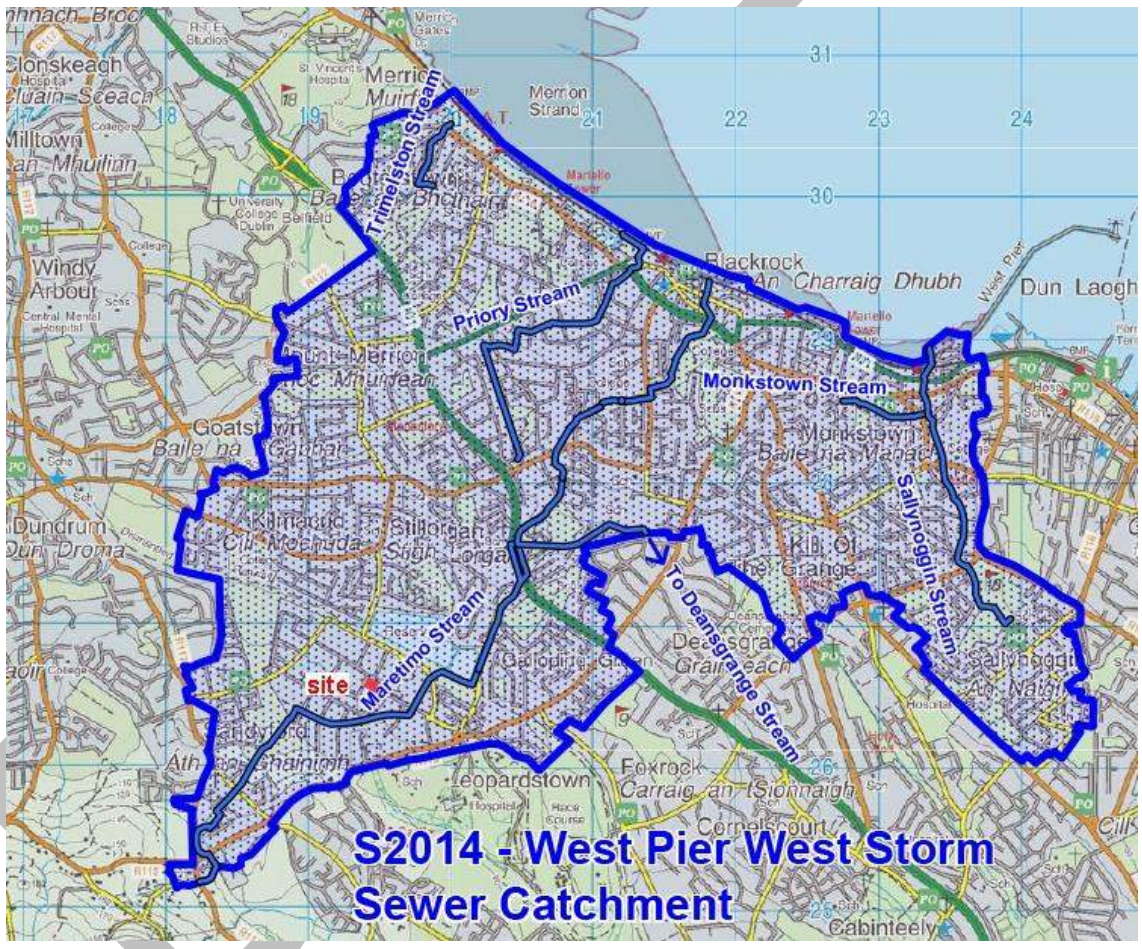

Figure 4 Extract from GDSDS Fig-9.3.15-S2014-West-Pier-Storm-Sewer-Catchment

Receptor

The receptor is the proposed development with a ground floor level of 88.50 mOD, a lower ground floor level of 84.15 mOD and a basement level of 81.50 mOD. The lowest level at which tidal water could enter the proposed development would be from Carmanhall Road at a level of 84.00 mOD and along the Inner Street which will have a level of 84.0 - 84.8mOD. All ventilation and other openings below this level will be bunded to a minimum level of 84.5 mOD.

Pathway

The subject site is located some 4 km from the Irish Sea at in Blackrock at an elevation of 84.0 mOD (Malin) compared to a high tide level of below 5.0m OD (Malin) at Blackrock.

Given that the site is located some 4 km inland from the Irish Sea and that there is a significant difference of 79 metres in level between the subject site and high tide, there is no pathway between the source and the receptor.

Risk of Flooding

Given that the site is located inland from the Irish Sea and that there is a significant difference in level between the subject site and high tide, the risk from tidal flooding is insignificant.

Mitigation Measures

As the risk from tidal flooding is insignificant, no flood mitigation measures were required to be considered.

3.3 Fluvial

Source

The subject site is located in the catchment area of the Carysfort Maretimo Stream. The Carysfort Maretimo Stream rises to the southwest of Sandyford Village. It flows in a north easterly direction through the Sandyford Business District and Stillorgan before discharging into Dublin Bay at Blackrock at an elevation of 4.5 metres OD (Malin). See Figure 4.

Documents Consulted

The following documents including flooding reports and records were consulted by Waterman Moylan during the preparation of this Flood Risk Assessment: -

- Carysfort Maretimo Improvement Scheme, Part Planning Report, Final Issue, DLRCC, March 2008.
- Strategic Flood Risk Assessment, Appendix 13, DLR County Development Plan, 2016 – 2022
- Carysfort Maretimo Fluvial Flood Extent, Page 5 of 7, OPW, 2017.

Carysfort Maretimo Improvement Scheme 2010

The Carysfort Maretimo Flood Relief Scheme was completed by DLRCC in 2011. The objective of the Scheme was to deliver solutions for flooding by enhancing channel capacity and dealing with other deficiencies in the stream following a number of severe flooding events during the previous decade particularly following a very localised, high intensity storm in July 2007.

As part of the Scheme, works were carried out at various locations along the stream between Brewery Road at Stillorgan Reservoir and Blackrock.

The works carried out included the following measures: -

- Provision of flood protection walls.
- Upgrading of existing trash screens and provision of new trash screens.
- Modification to existing stream structures, including weirs and chambers.
- Removal of structures acting as flow obstructions.
- Provision of additional culverts and manhole chambers.
- Stream training and channel widening.
- Culvert inlet improvement measures.
- Provision of access to trash screens for maintenance purposes.
- Stream bank protection measures.
- Removal of scrub and vegetation where these act as flow obstructions.
- Associated works such as service and utility diversions.

The listed works were carried out downstream of the subject site works were carried out at various locations along the stream between Brewery Road at Stillorgan Reservoir and Blackrock.

Strategic Flood Risk Assessment, Appendix 13, DLR Development Plan 2016 -2022

Section 5.3.7 *Carysfort Maretimo* of the Strategic Flood Risk Assessment in Appendix 13, DLR Development Plan 2016 -2022 advises that

> *The CFRAM shows flood risk along the majority of the Carysfort Maretimo River, being a combination of Flood Zone A and B and covering a range of land existing land uses, including open space, residential and office and enterprise (Figure 5-7).*
>
> *In particular, flooding is indicated at Blackrock Bypass, Brookfield, Carysfort Avenue, Avondale Lawn, Carysfort Hall, Avoca Park, Grove Paddock, Stillorgan Grove, Stillorgan Road and Brewery Road, Blackthorn Avenue and Blackthorn Road, Corrig Road, Blackthorn Drive, Lakelands, Moreen Estate, along M50 at Sandyford Interchange, Sandyford Park, Coolkill, Sandyford Downs and Sandyford Village (15).*
>
> *Where there is existing residential housing, and supporting infrastructure, Part 1 and 2 of the Justification Test have been applied and passed and flood risk can be managed through nonstructural responses. Future development within Flood Zone A and B should be limited to extensions, changes of use and small-scale infill and flood risks can be managed through a site specific FRA, which should include consideration of culvert blockage (where appropriate) and the impact this could have on flood risk at lower return periods.*

The majority of flood risk highlighted in the Sandyford Business District and surrounding area is shown to be Flood Zone B, with small pockets indicated to be Flood Zone A. Where less vulnerable development is proposed within or near Flood Zone A or B a site specific flood risk assessment should be undertaken with the aim of a) refining the delineation of flood risk based on local topography and surface water systems; b) demonstrating that the proposed development will not increase flood risk to neighbouring lands; and c) developing flood management measures appropriate to the development proposed.

There is a length of defence along this watercourse which runs parallel to Rockfield Park (16). These defences are of robust construction, although consideration of the impacts of overtopping, either through higher return period events or with the impact of climate change on river flows, should be taken into account in any site specific flood risk assessment. Breach assessment is unlikely to be required.

The extent of flooding along the Carysfort Maretimo Stream is illustrated in Figure 5 which was reproduced from Fig 5.3.7 SFRA, Appendix 13, DLR Development Plan 2016-2022.

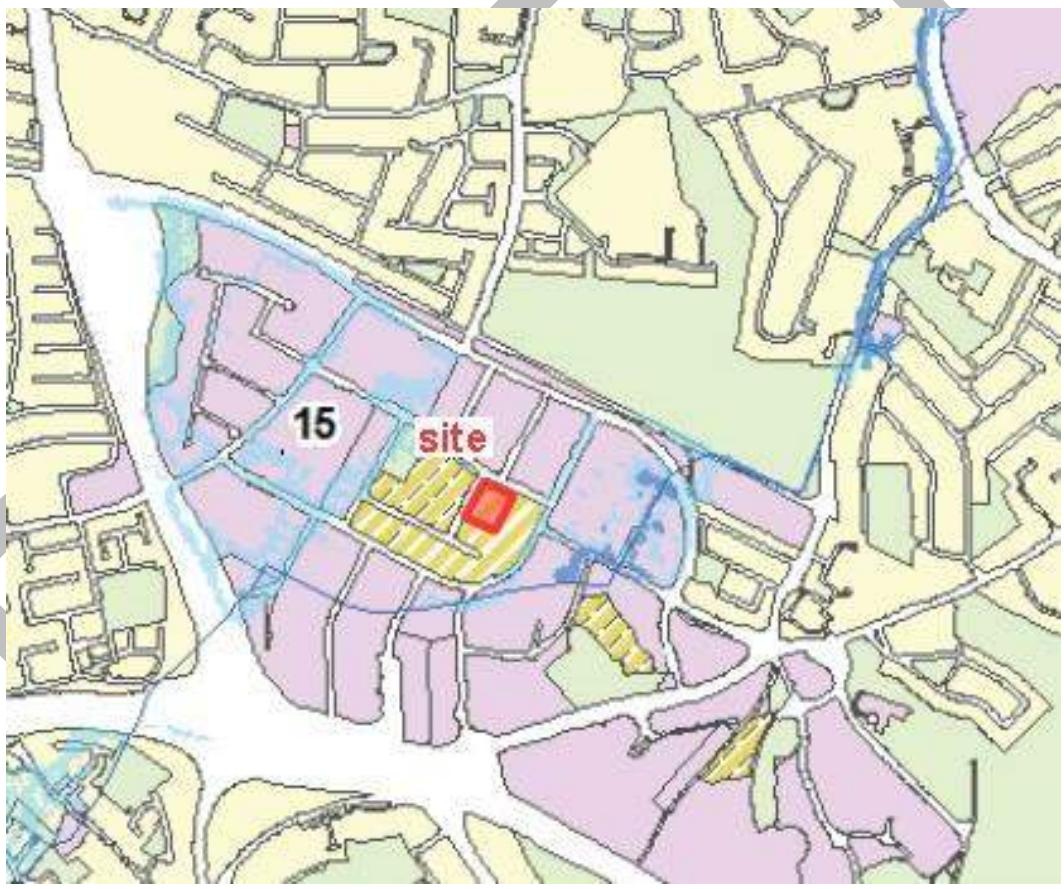

Figure 5 Carysfort Maretimo Stream

(Reproduced from Fig 5.7 SFRA, Appendix 13, DLR Development Plan 2016-2022

Flood Extent Mapping 2017

The location of the proposed development is shown on Map 5 of the Carysfort Maretimo Flood Extent Mapping published by OPW in October 2017. See Figures 6 and 7.

The predicted 1 in 1,000 water level shown on this map for the 0.1% Fluvial AEP event at Node SO 19267035 some 175 metres to the southeast of the subject site is 84.37mOD which is below the ground level at the subject site.

Due to the topography in the surrounding area, any floodwater will flow to the east and north away from the subject site.

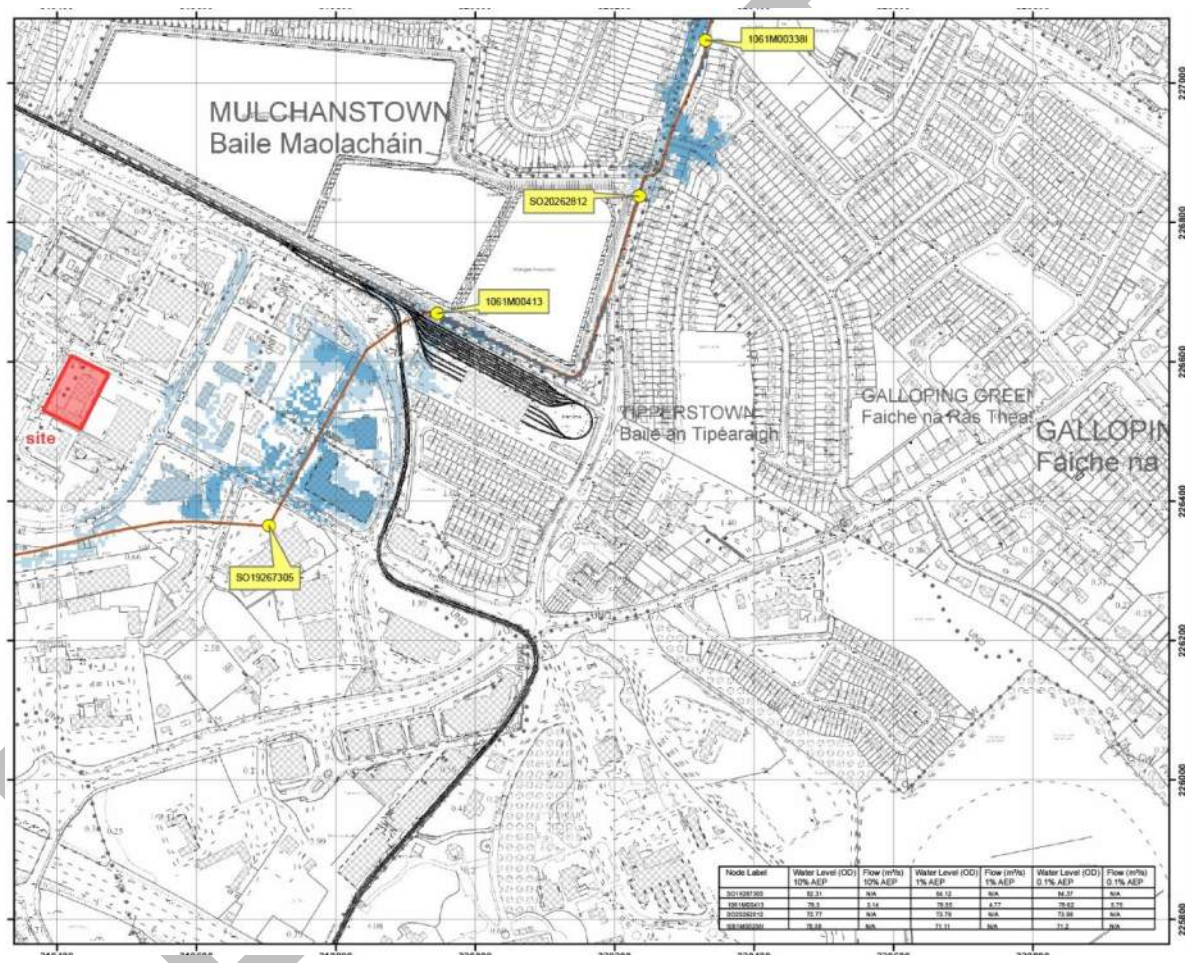

Figure 6 Carysfort Maretimo Flood Map 5, OPW, 2017

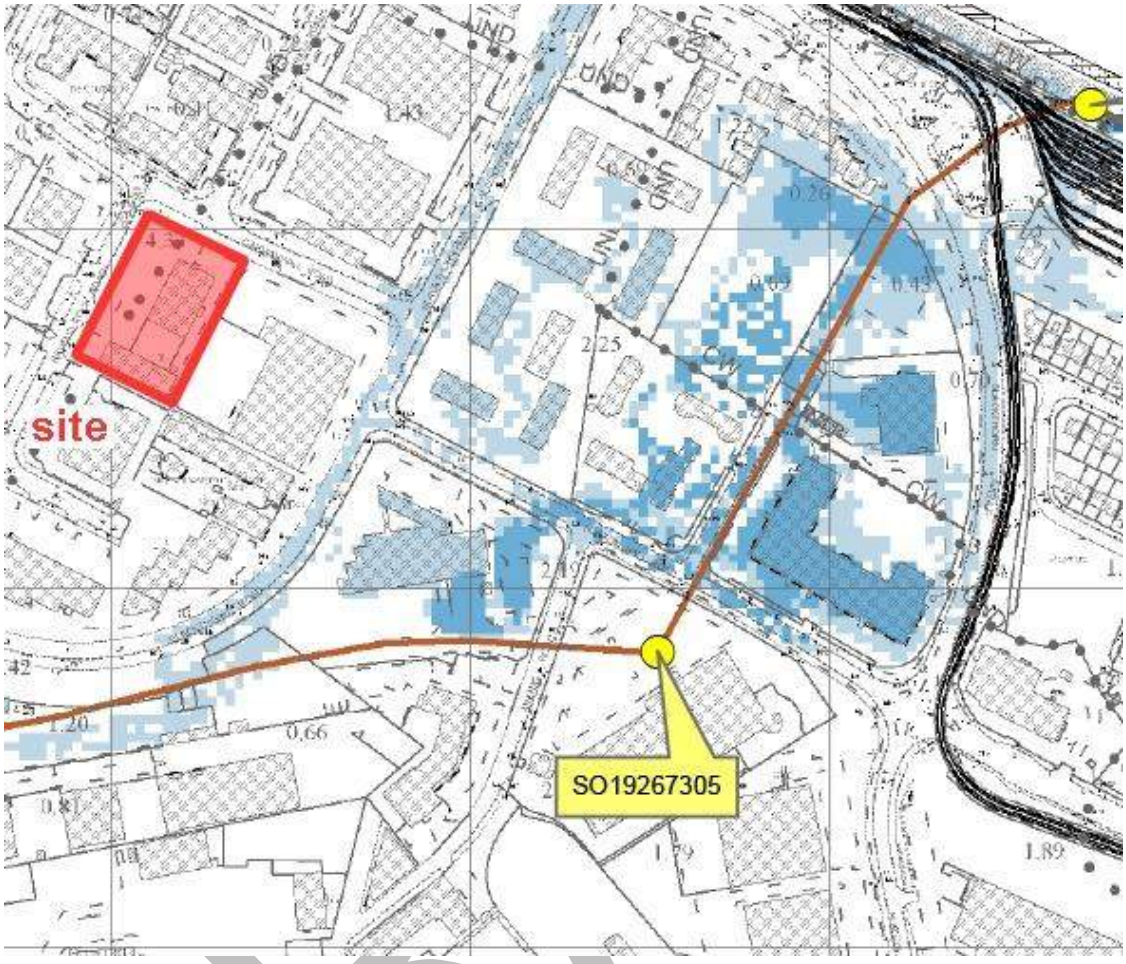

Figure 7 Extract from Carysfort Maretimo Flood Map 5, OPW, 2017

Receptor

The receptor is the proposed development with a ground floor level of 88.50 mOD, a lower ground floor level of 84.15 mOD and a basement level of 81.50 mOD. The lowest level at which tidal water could enter the proposed development would be from Carmanhall Road at a level of 84.00 mOD and along the Inner Street which will have a level of 84.0 - 84.8mOD. All ventilation and other openings below this level will be bunded to a minimum level of 84.5 mOD.

Pathway

The subject site is located at an elevation of 84.0 – 88.0metres OD (Malin).

Attenuated surface water drainage from the subject site will discharge into the existing public drain on Carmanhall Road with a cover level of 84.0 mOD and an invert level of 81.0 mOD.

This drain in turn discharges outfalls into the Carysfort Maretimo Stream in the area of the Luas Sandyford Depot.

The closest section of the Carysfort Stream to the proposed development is Node SO19267305 more than 200 metres to the southeast of the subject site.

The tabulated water level predictions at Node SO19267305 are

- 0.1% AEP: 84.37 mOD
- 1% AEP: 84.12 MOD
- 0.1% AEP: 82.31 MOD

Given that the site is located more than 200 metres away the Carysfort Maretimo Stream and that there is level difference between the subject site and the Stream, there is no pathway between the source and the receptor.

In addition, other low-lying areas located between the node and Blackthorn Road will store flood water as confirmed by Map 6 which is based on topography. In this way, any flood water will be prevented from reaching the site due to the topography of the area. Flood water on Blackthorn Road will in fact flow north, as the existing topography of the road falls in that direction.

Risk of Flooding

Given that there is no pathway between the source and the receptor, the risk from fluvial flooding is insignificant.

In addition, the various flood maps and reports published by OPW during the past decade confirm the absence of any fluvial flooding in the area of the subject site or its immediate environs.

Mitigation Measures

As the risk from fluvial flooding is insignificant, no flood mitigation measures were required to be considered.

3.4 Pluvial

Pluvial flooding is from heavy rainfall and is often referred to as flooding from surface water. Surface water flooding can occur as a result of overland flow or ponding during periods of extreme prolonged rainfall. Flooding may occur through any of the pathways outlined in Table 2 and the risk associated with each pathway is outlined below.

Table 4 Pathways/Receptors

	Pathway	**Receptor**
1	Surcharging of the proposed internal drainage systems during heavy rainfall events leading to internal flooding	Proposed development – Basement and buildings
2	Surcharging from the existing surrounding drainage system leading to flooding within the subject site by surcharging surface water pipes	Proposed development – Basement and buildings

3	Surface water discharging from the subject site to the existing drainage network leading to downstream flooding	Downstream properties and roads
4	Overland flooding from surrounding areas flowing onto the subject site	Proposed development – Basement and buildings
5	Overland flooding from the subject site flowing onto surrounding areas	Downstream properties and roads

3.4.1 On-site drainage system surcharging

The proposed on-site surface water drains have been designed to accommodate flows from a 5-year return event which indicates that the internal system may surcharge during rainfall events with a return period in excess of five years. Therefore, the likelihood surcharging of the on-site drainage system is considered high over the lifetime of the building. The risk of flooding is mitigated however by providing attenuation for the development which can store water for the 1 in 100-year storm event plus a 20% allowance for climate change and therefore the residual risk is low.

3.4.2 Flooding from the existing surrounding drainage system surcharging

The existing drainage system is a separate foul and surface water drainage systems and the existing site drains to the separate foul and surface water public sewers on Carmanhall Road. The surface water drainage from the proposed development will be attenuated on site and will have a restricted outflow to the public surface water sewer, reducing the rate of run-off to the sewer and further reducing the risk of the sewer surcharging. Therefore, the likelihood of flooding due to surcharging the existing drainage network is considered low.

3.4.3 Surface water discharge from the subject site causing downstream flooding

The proposed development site is already 100% hard surfaced. The development, as designed, will increase the permeable area due to the installation of permeable paving, planters, green roofs and podium areas and swales all of which will help reduce the volume of run-off from the site during low storm events. Surface water discharging from the development will be limited by a hydro-brake with a peak discharge of 2 l/s/ha. This will reduce the effects of the development on the local drainage network further reducing the risk of downstream flooding. The likelihood of the proposed development resulting in pluvial flooding downstream of the site is therefore considered extremely low.

3.4.4 Overland flooding from surrounding areas

A map showing all flood events within close proximity of the subject site is provided below in Figure 8. No single or recurring flood events are recorded in the area of the subject site.

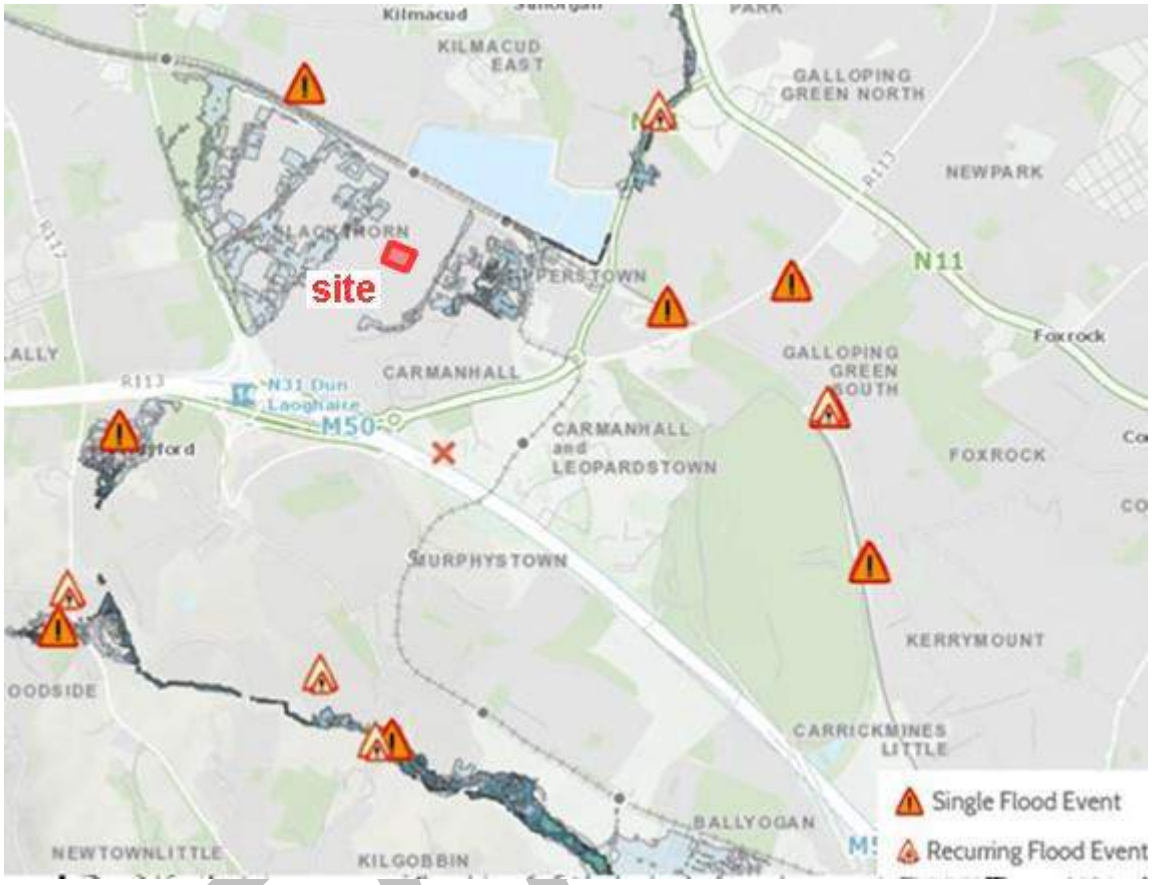

Figure 8 Past Flood Events

3.4.5 Overland flooding from the subject site

Positive drainage in the form of gullies and ACO drains as well as SUDS systems such as permeable paving and swales will be provided to collect and discharge rain falling on hard standing areas to the attenuation tanks. External pavement will be laid so that water will be directed away from building entrances towards the drainage gullies and channels. Building maintenance will be responsible for ensuring the gullies and channels are kept free of debris and therefore, the risk to both the development and the surrounding areas from overland flooding from the development is considered low.

3.5 Groundwater

Source

On-site groundwater is a potential source of flooding but unlikely due to the elevated location of the site.

Pathway

During periods with extreme prolonged rainfall groundwater might come to the surface and flood the proposed development.

Receptor

The receptor is the proposed development with a ground floor level of 88.50 mOD, a lower ground floor level of 84.15 mOD and a basement level of 81.50 mOD. The lowest level at which tidal water could enter the proposed development would be from Carmanhall Road at a level of 84.00 mOD and along the Inner Street which will have a level of 84.0 - 84.8mOD. All ventilation and other openings below this level will be bunded to a minimum level of 84.5 mOD.

Likelihood

The likelihood of ground water flooding for the subject site is remote as the site is located in a relatively elevated area.

Consequence

The consequence of ground water flooding would be the damage to property and loss of amenity.

Risk

For the subject site, there is a low risk of ground water flooding.

Flood Risk Management

In the event of ground water flooding on site, this water can escape from the site in a south-westerly direction.

3.6 Human / Mechanical Errors

The subject land will be drained by an internal private storm water drainage system which discharges to the public surface water network to the north of the subject site. This internal surface water network is a source of possible flooding from the system if it were to block. If the proposed private drainage system blocks this could lead to possible flooding on the podium levels, within the private areas and basement levels and within the private access road and landscaped areas.

In order to mitigate against the risk of flooding from blockages the surface water network must be regularly maintained and where required cleaned out. The building management team will be expected to prepare and follow a maintenance schedule which ensures all drainage is checked and cleared at least annually and after a heavy storm event.

Tree pits, green roofs and permeable paving and catch-pit gullies and manholes will be provided in order to minimise the volume of debris entering the drainage system and mitigate the risk of flooding.

Should a partial or total blockage occur within the drainage system the surrounding ground levels have been set so that the resulting flood water is directed away from the building entrances. Should the surface water system along the landscape areas and access road suffer a 50% blockage, the overland flood route will direct this runoff water to the access road at the eastern boundary of the site and finally north to Carmanhall Road. Should a 50% blockage occur in the basement system the flood water will flow to the basement -2 level which has the lowest level at 81.60m OD where it will be stored within the carpark before being pumped out to the public sewer. Any flood water in the basement will be instantly recognisable to the site management team which will allow for a fast response. The total volume required to be stored within the attenuation tank for the 1 in 100 year storm plus 30% climate change is 354 m^3. Shall a 50% blockage occurred, a total volume of 177 m^3 would be flooded within basement -2 carpark. The total B2 car park areas is in excess of 1,320m^2 therefore, if the basement were to flood in a 1 in 100 year plus 30% climate change event, 135 mm of water across the basement floor would accommodate 179 m^3 of storage. The likelihood of this occurring is extremely low considering the steps outlined above to prevent a blockage occurring therefore the residual risk is considered low and therefore the risk to the residential dwellings is reduced.

Upon adoption of the proposed flood risk management strategies, outlined above, there is a **low** residual risk of overland flooding from human / mechanical error.

4. Sequential Test

A sequential approach to planning is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of flooding. The sequential approach is set out in *"The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009"* and shown in Figure 4-1.

Figure 4-1: Sequential Approach (extract from Dublin City Council Development Plan 2016-2022 SFRA)

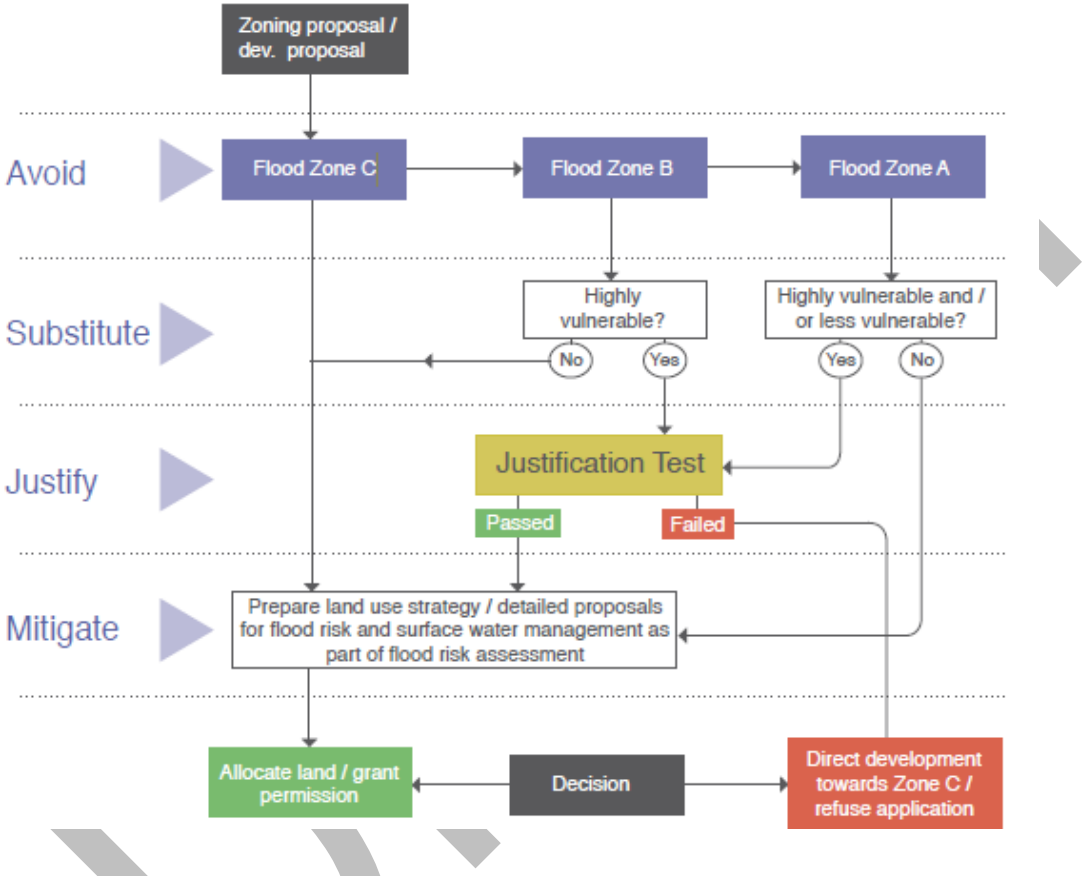

Figure 5.2 lists the vulnerability classes assigned to each land use and type of development, Figure 5.1 outlines the matrix of vulnerability versus flood zone. Both tables have been taken from the *Planning and Flood Risk Management Guidelines for Planning Authorities, 2009, OPW*.

All of the lands that are proposed to be developed on site are within Flood Zone C as they are at a low risk of flooding from all sources. Therefore, the proposed development is deemed an appropriate use of the site, following the sequential approach.

5. Conclusions and Recommendations

The subject site has been analysed for risks from flooding from the Irish Sea / Dublin Bay, the Carysfort Maretimo Stream, the internal and external surface water network, ground water and failures of mechanical systems.

Through careful design and appropriate mitigation measures, the risks and consequences of flooding have been mitigated across the development.

The Flood Risk Assessment is summarised in Table 4 below.

Table 5 Summary of the Flood Risks from each flooding type.

Source	**Pathway**	**Receptor**	**Likelihood**	**Consequence**	**Risk**	**Mitigation Measures**	**Residual Risk**
Tidal	None	People, Property	Remote	None	Low	None Required	Low
Fluvial	None	People, Property	Remote	None	Low	None Required	Low
Foul Water	Drainage network	People, Property	Remote	Possible damage to property and loss of amenity	Low	None Required	Low
Surface Water	Drainage network	People, Property	Remote	Possible damage to property and loss of amenity	Low	None Required	Low
Ground Water		People, Property	Remote	Possible damage to property and loss of amenity	Low	None Required	Low
Human Error Mechanical Error	Drainage network	People, Property	Possible	Possible damage to property and loss of amenity	Low	Required	Low

UK and Ireland Office Locations

Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Tack Sandyford SHD

March 2022

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Engineering Consultants

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Project Number: 21-118

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	Mar 22	S Nahas L.Ruiz		

Comments

Disclaimer

Content

List of Figures

List of Tables

Appendices

1. Introduction

Waterman Moylan have been appointed on behalf of Sandyford Environmental Construction Ltd. to accompany a planning application to An Bord Pleanala (ABP) for a residential development on a brownfield site at the junction of Carmanhall Road and Ravens Rock Road, Sandyford, Dublin 18. It is also proposed to build 1 No. Creche along with resident support facilities/resident services and amenities.

This report describes the criteria used to design the storm water discharge, disposal of foul water, water supply and vehicular access to the developed site.

2. Site Description

2.1 Site Location

The subject site is located at Sandyford in south County Dublin.

The site has an area of 0.57ha (1.4 acre) but for the purpose of encompassing the proposed access junctions, services connections and landscaping, the area within the red line for the planning application has been extended to 0.7ha.

The site was formerly occupied by Tack Packaging but at the time of writing in February 2022, it was unoccupied save for a number of empty buildings.

The adjoining site to the east at the junction of Carmanhall Road and Blackthorn Road was formerly occupied by Avid Technology.

Figure 1 Site Location Map (Google Images)

2.2 Site Description

The site comprises the former Tack Packaging site the junction of Carmanhall Road and Ravens Rock Road. The site area is approximately 0.57ha and is currently largely hardstanding.

The site falls from southwest to northeast ranging in level from 88.0mOD in the southwest to 84.0 mOD in the northeast. The existing access to the site is from Ravens Rock Road.

The adjoining site to the east at the junction of Carmanhall Road and Blackthorn Road was formerly occupied by Avid Technology.

2.3 Proposed Development

The proposed development will comprise some 207 Build-to-Rent residential units. See Figure 3.

Car parking with a total of 79 car spaces will be provided at Lower Ground Level and Basement. Cycle parking with 288 spaces will be provided at Lower Ground Level. Access for vehicular traffic is proposed from Ravens Rock Road with egress onto Carmanhall Road.

The public realm around the site will incorporate an upgrade of the pedestrian and cycle environment.

The development includes all associated infrastructure to service the development including access junctions, footpaths and cycle paths together with a network of watermains, foul water drains and surface water drains.

Figure 2 Proposed Site Layout

The existing ground levels around the site range from 89 m – 84 m OD. The ground floors of the proposed buildings step across the site to mimic the existing levels as far as reasonably practicable to minimise cut and fill across the site.

2.4 Contiguous Development

A concurrent development with a separate Engineering Assessment on the former Avid Technology site to the east will comprise 336 Build-to-Rent residential units and 118 car parking spaces at Lower Ground Level and Basement. Access is proposed from Carmanhall Road and egress onto Blackthorn Road.

The foul and surface water disposal, as well as water supply arrangements from this adjoining development will be separate from those serving the subject site.

3. Foul Water Drainage

3.1 Receiving Environment

There is an existing 225 mm Ø foul sewer located adjacent to the site along Ravens Rock Road and Carmanhall Road. There is also a 225mm Ø foul sewer along Arkle Road to the northeast of the subject site. Details of the adjacent foul sewer are shown in Appendix A – Irish Water Record Maps.

The foul sewer receiving environment for the proposed development consists of the 225mm foul sewer within Arkle Road as required by Irish Water.

Waterman Moylan drawing No's 21-118-P122 and P124 show the proposed foul water sewer network for the subject site.

It is proposed to drain the subject site to the existing 225mmØ foul sewer network on Arkle Road the northeast of the subject lands. It is important to note that the Tack Site (subject site under this planning application) will discharge foul water independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites as set out in the Irish Water Pre-Connection Enquiry.

3.2 Irish Water Pre-connection Enquiry Response

A pre-connection inquiry was submitted to Irish Water in November 2021 in respect of the foul connection from the proposed development. Subsequently, Irish Water has confirmed that based on the size of the proposed development and on the capacity currently available, that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated.

The Irish Water Pre-Connection Enquiry Form Response Letter (Ref. No. CDS21008079) dated 25 January 2022 is attached in Appendix B of this report. A set out above, it is important to note that the Tack Site (subject site under this planning application) will discharge foul water independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites as set out in the Irish Water Pre-Connection Enquiry.

3.3 Irish Water Statement of Design Acceptance

The foul and water supply design for the proposed development was submitted to Irish Water. Subsequently, Irish Water issued a letter of design acceptance stating that there are no objections to the proposals. A copy of the letter has been included in Appendix F.

3.4 Proposed Foul Water Drainage

The proposed development will consist of 207 No. residential units and 1 No. Creche. Based on Irish Waters Code of Practice, the calculation of the peak foul flow from the proposed development can be seen in Tables 1 and 2 below.

Table 1 Calculation of Proposed Foul Water Flow

Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge
Residential Units	207	150	2.7	1.1	92,218.5
Creche	1	50	78 67 pupils 11 staff	1.1	4,290
				Totals	**96,508.5 l/d**

Table 2 Calculation of Proposed Peak Foul Flow

Calculation of Proposed Peak Foul Flow		Units
Dry Weather Flow Residential (DWF)	1.07	l/s
Dry Weather Flow Commercial (DWF)	0.049	l/s
Peak Foul Flow Residential (=6 x DWF)	6.42	l/s
Peak Foul Flow Commercial (=4.5 x DWF)	0.22	l/s
Total Peak Foul Flow	6.64	***l/s***

Waterman Moylan Drawing's 21-118-P122 illustrate the proposed layout for the foul water sewer outfall for the subject site.

3.5 Network Design

Foul Water Drains will be uPVC to Irish Water specification or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will be laid strictly in accordance with Irish Waters code of practice for Wastewater Infrastructure and Irish Water requirements for taking in charge.

All manholes will be constructed in block work, precast or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying planning submission drawing.

4. Surface Water Drainage

4.1 Introduction

The following section deals with surface water drainage design including details of the SuDS measures proposed as part of the development.

There is an existing 300mm diameter surface water sewer along Ravens Rocks Road. West of the site, that discharges into a 450mm diameter surface water sewer along Carmanhall Road, north of the site. Refer to Appendix A for the existing surface water record map.

The existing site currently drains surface water, unrestricted, to the above-mentioned sewers. It is proposed that the development will attenuate the surface water on-site before discharging at the existing greenfield rate.

The existing run-off rate for the existing hardstanding areas on site was estimated for the 1 in 1, 1 in 30 and 1 in 100 year return periods using the modified rational method:

Q = 2.78 x A x I (where A is the total pre-development area being drained in Hectares and I is the rainfall intensity in mm/h as estimated for the 60min storm from Flow using Met Eireann Data)

A = 0.398 ha (current hardstanding as measured from topographical survey)

I – 1 year return period = 11.235 mm/h

30 year return period = 27.335 mm/h

100 year return period = 43.042 mm/h

Table 4-1 Existing Run-off Rates for impermeable areas

Rainfall Event	Existing development run-off (l/sec) – Hardstanding Areas
Q1	2.78 x 0.398 x 11.235 = **12.43**
Q30	2.78 x 0.398 x 27.335 = **30.24**
Q100	2.78 x 0.398 x 43.042 = **47.62**

4.2 Site Characteristics

The following parameters have been used in greenfield run-off rate and attenuation calculations.

Table 2 Surface Water Catchment Details

	Catchment
Site Area (Catchment) - Ha	0.57
Hardstanding – Ha	0.46

SAAR – mm*1	930
SOIL Index*2	0.37
Climate Change	30%

*1 – From Met Éireann data.

*2 – The soil type of Ireland indicated Soil Type 1. Furthermore a Site investigation was carried out in February 2021 on the adjacent AVID site. The results of the site investigation revealed there is no infiltration present on the site. These soil conditions are expected for Soil type 3 and therefore 0.37 is used as Soil Index for this site. Refer to Appendix C for the above-mentioned Site Investigation.

The site investigation also revealed a highwater table is present at the site. The highest groundwater table was recorded as 1.63 - 2.5 m bgl (below ground level), in June 2020, four months after installation of the standpipes.

4.3 Greenfield run-off rates

The Local Authority requirements are that post-development run-off rates are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, using the UK SUDS Website. Based on a total hardstanding of 0.46 Ha, the Greenfield run-off for the site is 1.8 l/s (Qbar). Please refer to Appendix D.

4.4 SuDS Assessment

As per Dun Laoghaire County Council guidelines surface water should be managed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Volume 6, for New Developments and CIRIA documents. These documents specify that surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the buildings prioritised.

Sustainable Urban Drainage Systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as SUDS. They are typically made up of one or more structures, built to manage surface water run-off. The use of SUDS to control run-off also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

A stormwater management or treatment train approach ensures that run-off quantity and quality is improved. The following objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in stormwater run-off flows that occur as land is urbanised and to help mitigate the impacts of stormwater quality on receiving systems:

1) **Source control:** conveyance and infiltration of run-off; and
2) **Site Control:** reduction in volume and rate of surface run-off, with some additional treatment provided.

The applicant has considered the use of all appropriate SUDS measures as part of the site SUDS strategy, details are outlined in Table 4 below.

Table 3 SuDs Measures

SUDS Stage	SUDS Measure	Measure Outline	Use on Site
Source Control	Permeable Asphalt	Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater run-off to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated. Permeable asphalt is very effective at removing a wide range of pollutants from surface water runoff as they are either retained on the pavement surface or flushed into the granular subbase where they become trapped and are degraded over time.	Permeable asphalt will be utilised for the surface of the main road to provide treatment and storage to rainwater falling on these areas. As described above, the ground conditions are not considered suitable for infiltration and the groundwater table was found at high level. Therefore, the permeable asphalt would be lined with an impermeable geotextile membrane due to the lack of infiltration available on the site and to prevent groundwater ingress. The design will include a perforated pipe to convey surface water to the site wide drainage system.
	Green Roofs/ Green Podium	As well as providing ecological benefits, green roofs contribute the following positive effects to surface water drainage design: • The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network. • Due to the time for water to infiltrate and permeate the substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding.	Green Roofs have been considered and incorporated into the development proposals in accordance with Appendix 16 of DLRCC County Development Plan. The locations of the green roofs are illustrated on the accompanying Waterman Moylan 21-118-P125 - SUDS Measures. 60 % of Green Roof as outlined in Section 3.1 of DLRCC Green Roof guidance document will be provided and is indicated on the Architects drawing.

		• They improve water quality through the filtration of pollutants during the process of water infiltration. This provides treatment in line with CIRIA SuDS Manual management train. Although green roof space can reduce peak flow rates in the small storm events and aid in reducing the volume of run-off from the site, they operate as conventional roofs in higher storm events. Therefore, green roofs cannot be considered in the surface water drainage run-off calculations for the development. As stated in CIRIA C697 *"although green roofs absorb most of the rainfall that they receive during ordinary events, there is still the need to discharge excess water to the building's drainage system. This is because their hydraulic performance during extreme events tends to be fairly similar to standard roofs*."	
SUDS Stage	SUDS Measure	Measure Outline	Use on Site
Site Control	Attenuation Tank and Hydro-brake	Attenuation tanks are used to create a below ground void space for the temporary storage of surface water before controlled release to the stream. Hydro-brakes are used to restrict the outfall from the attenuation tank to the equivalent of the existing agricultural run-off. This ensures the development will not give rise to any impact downstream of the site.	It is proposed to use a concrete attenuation tank to store surface water on site before discharging to the public surface water sewer via a hydro-brake.

	Petrol Interceptor	A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater run-off. It is typically used in road construction to prevent fuel contamination of water courses carrying away the run-off. Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads and entering a drain before being deposited into the first tank inside the interceptor. The first tank builds up a layer of the hydrocarbon as well as other scum preventing it from entering the water course.	A petrol Interceptor will be installed, upstream of the proposed Attenuation tank as a final treatment level before discharging to the attenuation tank.

4.5 Stormwater Calculations

The total impermeable area of the catchment including roads, car-parking and roofs, is approximately 0.49 Ha, and the peak outflow will be limited to 1 l/s in the 1 in 100-year event. The 1 in 100 year critical design storm plus an additional 30% for climate change has been used for storm water attenuation calculations and a storage volume requirement of 353 m^3 is determined. A total volume of 420 m^3 will be provided in a concrete tank located beneath the podium at the car parking level. The calculation for the storage design is included in Appendix E. The proposed surface water drainage network is indicated on Waterman Moylan drawings 21-118-P120 - Proposed Surface Water Drainage Layout.

4.6 Network Design

As described above, the proposed surface water drainage system for this development has been designed as a SUDS system and uses permeable paving, green roofs green podium, below ground attenuation together with flow control devices and petrol interceptor to treat run-off and remove pollutants to improve quality, restrict outflow and control quantity.

Strict separation of surface water and wastewater will be implemented within the development. Surface water local drains will be a minimum of 225mm dia. and generally will consist of PVC (to IS123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H and will be laid strictly in accordance with the requirements of Dun Laoghaire Rathdown County Council.

4.7 Interception Storage

Interception storage is defined in the SuDS Manual as *"the capture and retention on site of the first 5mm of the majority of rainfall events"*. In accordance with the table 24.6 of the SuDS Manual CIRIA C753 the following guidelines have been used in calculating the area of the site benefiting from interception storage;

Table 4 Interception Mechanisms (Table 24.6 The SuDs Manual)

Systems	Interception methods assumed compliant for zero runoff from the first 5mm of rainfall for 80% of events during the summer and 50% in winter.
Green Roofs/podium	All surfaces that have green roofs/podium.
Permeable Paving	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement. Where the pavement also drains an adjacent impermeable area, compliance can be assumed for all soil types where the pavement is unlined, as long as the extra paved area is no greater than the permeable pavement area

As described in section 4.4 and 4.5 the proposed development will provide, Green Roofs, green podium, and permeable paving. In order to calculate the percentage area of site benefiting from each form of interception storage the site areas are described in Table 6 below and demonstrated on Waterman Moylan drawing 21-118-P125.

At Podium level, all the hardstanding areas will be discharged into the landscape areas. The design will include a perforated pipe to convey surface water to the surface water network at ground level in order to discharge and attenuate water into the attenuation tank.

Table 5 Interception Storage Provided

Area	Total Hardstanding Area m2	Interception mechanism	Interception Area m2	green roof %	Percentage Benefiting %
Roof Blocks A-B-C	2079.9	Green Roof	1250.7	60.1	60.1
Podium Level	1592.2	Green podium	1592.2	N/A	100.0
Main Road and Footpaths	887.5	POROUS ASPHALT paving	663.0	N/A	91.8
		Permeable paving footpaths	152.0	N/A	
TOTAL	4559.6		3657.9	**N/A**	**80.2**

Within the basement carpark area, any rainwater entering the system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment.

5. SuDS Maintenance

For the SuDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, drain manholes (including catch pits) and attenuation tanks will ensure adequate performance. The recommended program is outlined in the tables below.

Table 6 Concrete Attenuation Tank Maintenance Schedule

SUDS Element	Maintenance		
Attenuation Tanks	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

Table 7 Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required

	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

Table 8 Green Roof Maintenance Schedule

SUDS Element	**Maintenance**		
Green Roof	**Maintenance Issues**	Vegetation becoming either overgrown or dying	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.	Annually and after severe storms
		Inspect underside of roof for evidence of leakage.	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.	Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	Six monthly or as required
	Remedial Work	If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

6. Benefits to the Surrounding Existing Drainage Network

It is important to note the very significant benefit the proposed development will have on the existing drainage network. The site currently discharges surface water, unrestricted to the public stormwater sewer. The proposed development will significantly reduce the surface water run-off to the existing public drainage network as demonstrated in Table 11 below. The introduction of the SUDS measures outlined earlier will also improve the quality of the discharge.

Table 9 Surface Water Run-off rates

Rainfall Event	Existing development run-off (l/sec)	Proposed run-off (l/sec)	Difference (%)
Q1	12.43 l/s	1.8 l/s	-85.52%
Q30	30.24 l/s	1.8 l/s	-94.05%
Q100	47.62 l/s	1.8 l/s	-96.22%

7. Water Supply

7.1 Water Supply – General

There is one existing 6 inch diameter watermain supplying the site to the southwest corner. There is one existing 6 inch diameter Asbestos watermain along Ravens Rock Road to the west of the subject site which connects into a larger 14 inch diameter asbestos watermain along Carmanhall Road to the north.

A Pre-Connection Enquiry form was submitted to Irish Water in November 2021 which outlined the proposals for the water supply to the development to the north of the subject lands. Irish Water advised that a water connection to the public main is feasible without infrastructure upgrade by Irish Water. This connection would be to the 14 inch diameter Asbestos main along Carmenhall Road.

It is important to note that the Tack Site (subject site under this planning application) will be connected to the existing public watermain independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites, stating that Avid Site will need to be connected to the 6 inch diameter Asbestos main along Blackthorn Road and the subject (Tack) site to the 14 inch diameter Asbestos main along Carmenhall Road.

The water demand for the proposed development is calculated according to the Irish Water Code of Practice and is set out in Table 12 below.

Table 10 Total Water Demand

Description	No. of Units	Flow l/h/day	Population per Unit	Total Discharge (l/d)
Residential Units	207	150	2.7	83,835
Crèche	1	50	78 67 pupils 11 staff	3,900
Total				***87,735 l/d***

The total water requirement from the public supply, for the development, is estimated at 88 m^3/day.

Waterman Moylan Drawing 21-118-P150 shows the proposed indicative water supply layout for the subject site.

7.2 Irish Water Pre-Connection Enquiry

As set out above a pre-connection inquiry was submitted to Irish Water in November 2021 in respect of the foul connection from the proposed development. Subsequently, Irish Water has confirmed that based on the size of the proposed development and on the capacity currently available, that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated.

The Irish Water Pre-Connection Enquiry Form Response Letter (Ref. No. CDS21008079) dated 25 January 2022 is attached in Appendix B of this report. A set out above, it is important to note that the Tack Site (subject site under this planning application) will obtain a water supply independently from the adjacent site, Avid Site. However, the attached Irish Water Confirmation of Feasibility received assesses the cumulative impact of the development of the 2 No. sites as set out in the Irish Water Pre-Connection Enquiry.

7.3 Irish Water Statement of Design Acceptance

The foul and water supply design for the proposed development was submitted to Irish Water. Subsequently, Irish Water issued a letter of design acceptance stating that there are no objections to the proposals. A copy of the letter has been included in Appendix F.

8. Transport

8.1 Introduction

A site-specific Transport and Traffic Assessment (TTA) has been carried out by Waterman Moylan. This is included under separate cover as part of this application.

8.2 Site Access

Access to the proposed development is proposed Ravens Rock Road and egress onto Carmanhall Road.

An entrance only access is proposed on Ravens Rock Road for cars, service deliveries, refuse freighter and emergency vehicles. An exit only is proposed onto Carmanhall Road immediately to the west of the boundary between the subject site and the adjoining former Avid Technology site to the east.

These new entrance and exit points are also described in more detail in the accompanying TTA. They are in a 50 km/h zone. The junction into Carmanhall Road is designed to ensure a 2.4m x 45 metres in line with the Department of Transport 'Design Manual for Urban Roads and Streets' recommendation are provided as shown on the accompanying drawings. No development works will infringe upon this sightline provision.

8.3 Car Parking

Section 8.2.4.5 of the Dun Laoghaire Rathdown County Council Development Plan 2016 – 2022 consider the car parking requirements for various types of development. Specifically, Tables 8.2.3 set out the car parking standards for residential developments.

Based on these standards, Table 13 below details the maximum car parking spaces permitted for the proposed development.

Table 11 DLRCC Maximum Car Parking Required

Land Use	Units	Parking Standards	Car Parking Required
Apartments – 1 Bed	151	1 per unit	151
Apartments – 2 Bed	55	1.5 per unit	83
Apartments – 3 Bed+	1	2 per unit	2
Total	207	-	236

As per the Design Standards for New Apartments – Guidelines for Planning Authorities – December 2020, the subject proposed development meets criteria for reasonable grounds to minimise car parking provisions.

In suburban/urban locations served by public transport or close to town centres or employment areas and particularly for housing schemes with more than 45 dwellings per hectare net (18 per acre), as per guidelines mentioned above, planning authorities must consider a reduced overall car parking standard and apply an appropriate maximum car parking standard.

The development will provide 74 No. car parking spaces located between the basement and undercroft car parking. This equates to 0.35 No spaces/apartment across the development.

8.4 Cycle Parking

- Section 4.1 of the 'Standard for Cycle Parking and Associated Cycling Facilities for New Developments – Dun Laoghaire-Rathdown County Council 2018' sets out the cycle parking requirements as follows:

Table 12 Total Cycle Parking Spaces Required (DLRCC)

Land Use	No. of Units	Standards	Long Stay parking required	Short Stay Parking Required	Total Parking Required
Apartments	207	1 space per unit- Long Stay 1 space per every 5 units – Short Stay	207	43	250

- The Design Standards for New Apartments, who set out a requirement of 1 long stay space per bedroom and 1 visitor space for every two units, have also been reviewed with regards to cycle parking requirements and are set out in table 7.3 below.

Table 13 Total Cycle Parking Spaces Required (National Standards)

Land Use	No. of Units	Standards	Long Stay Parking Required	Short Stay Parking Required	Total Parking Required
Residential – 1 Bed	151	1 space per 1-bed unit – Long Stay 1 space per 2 units – Short Stay	151	75	227
Residential – 2 Bed	55	2 spaces per 2-bed unit - Long Stay 1 space per 2 units – Short Stay	55	27	82
Residential – 3 Bed	1	3 spaces per 3-bed unit - Long Stay 1 space per 2 units – Short Stay	1	1	2
Total	207 units		206	102	311

As can be seen on Table 14 above, the total number of cycle parking spaces required is 250. Table 15 shows a requirement for 311 spaces according to the National Standards. A total of 288 spaces will be provided of which 240 No. spaces will be provided for residents, and 48 No. spaces for visitors will be provided.

APPENDICES

A. Irish Water Records Map

carmanhall road - foul sewer

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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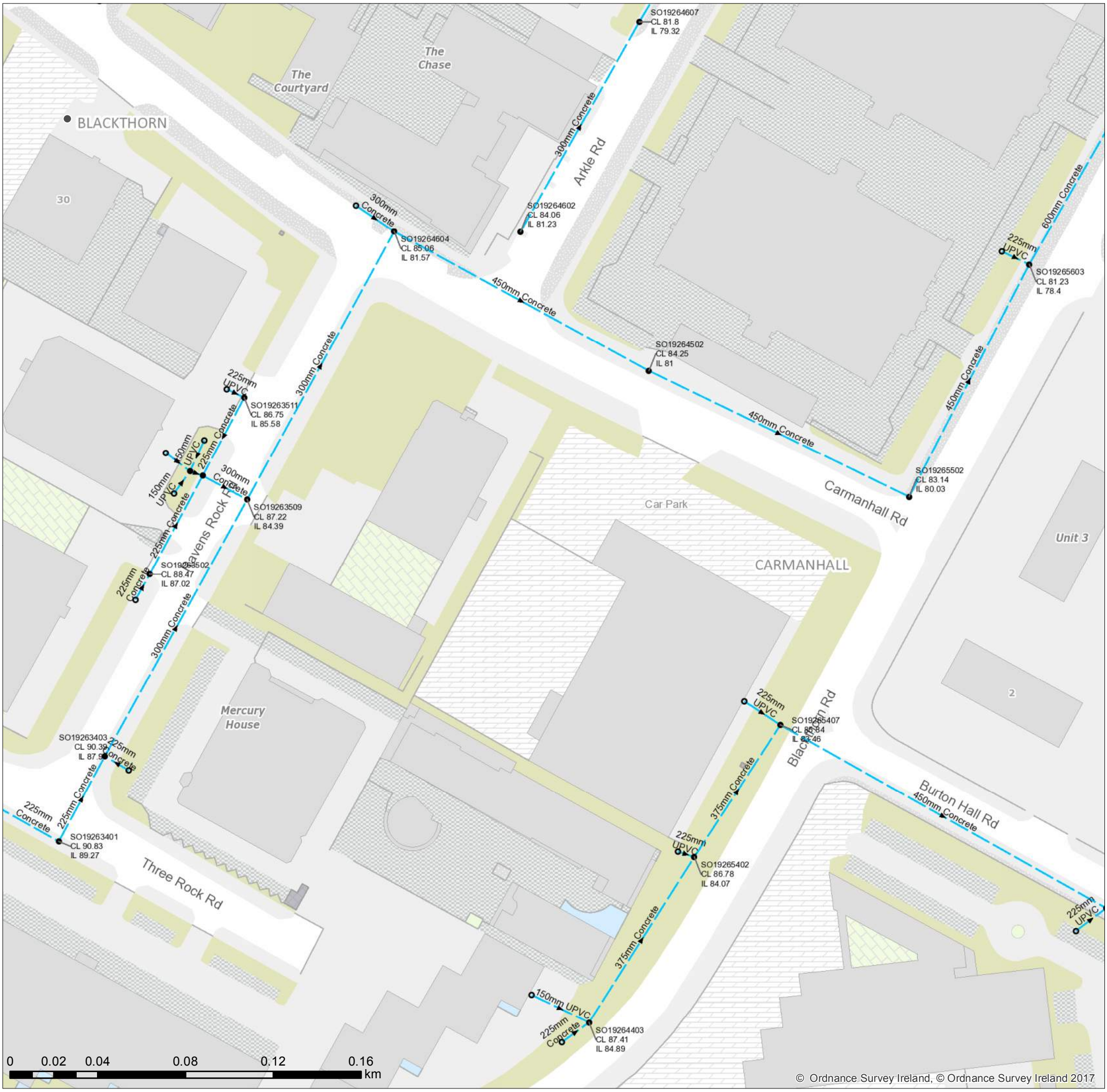
carmanhall road - stormwater



Water Distribution Network
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- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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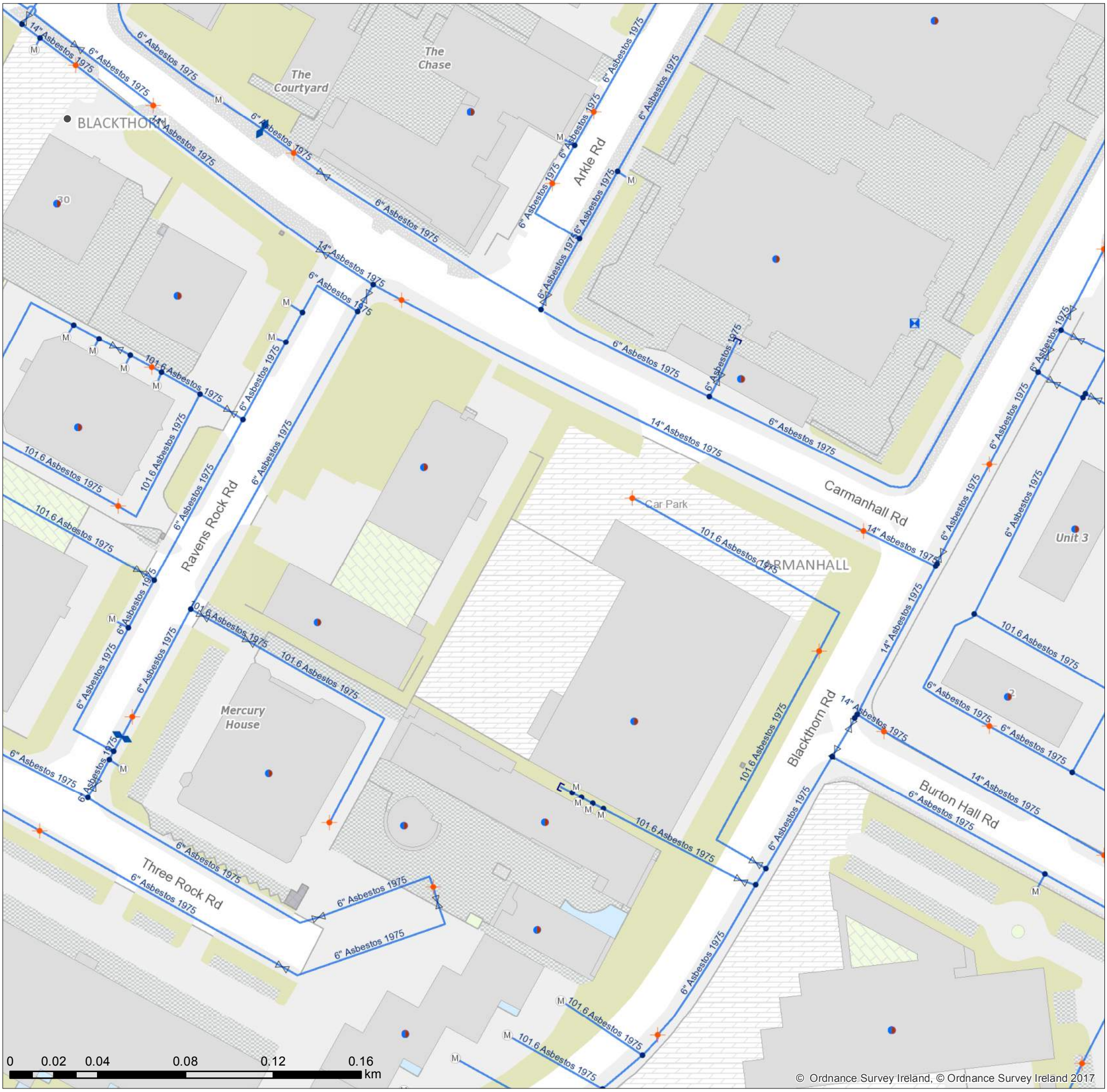
carmanhall road - watermains



Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
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- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
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- Overflow
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- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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Print Date: 01/03/2022

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B. Irish Water Pre-Connection Enquiry Response

Jairo Rivero

Block S
Eastpoint Business Park
Alfie Byrne Road
Dublin
D03H3F4
Ireland

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

25 January 2022

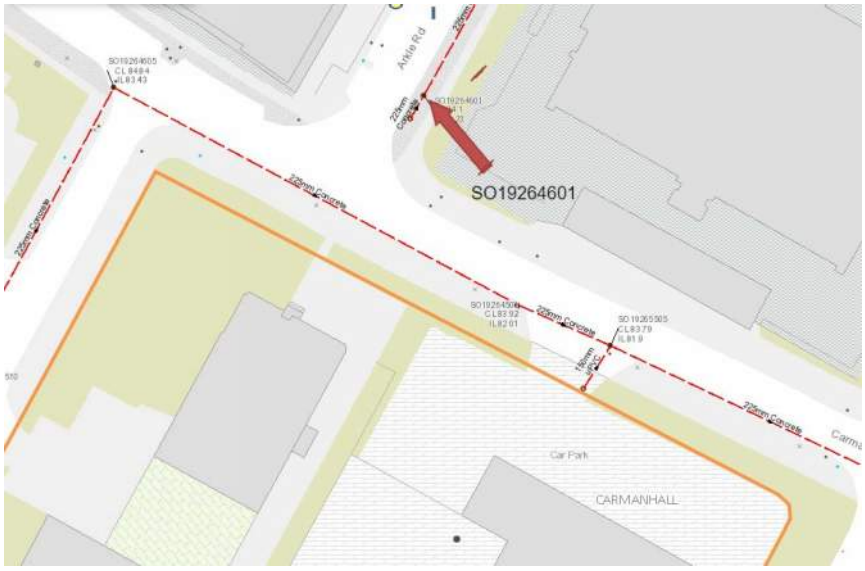
Re: CDS21008079 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 550 unit(s) at Ravens Rock Road, Sandyford, Dublin

Dear Sir/Madam,

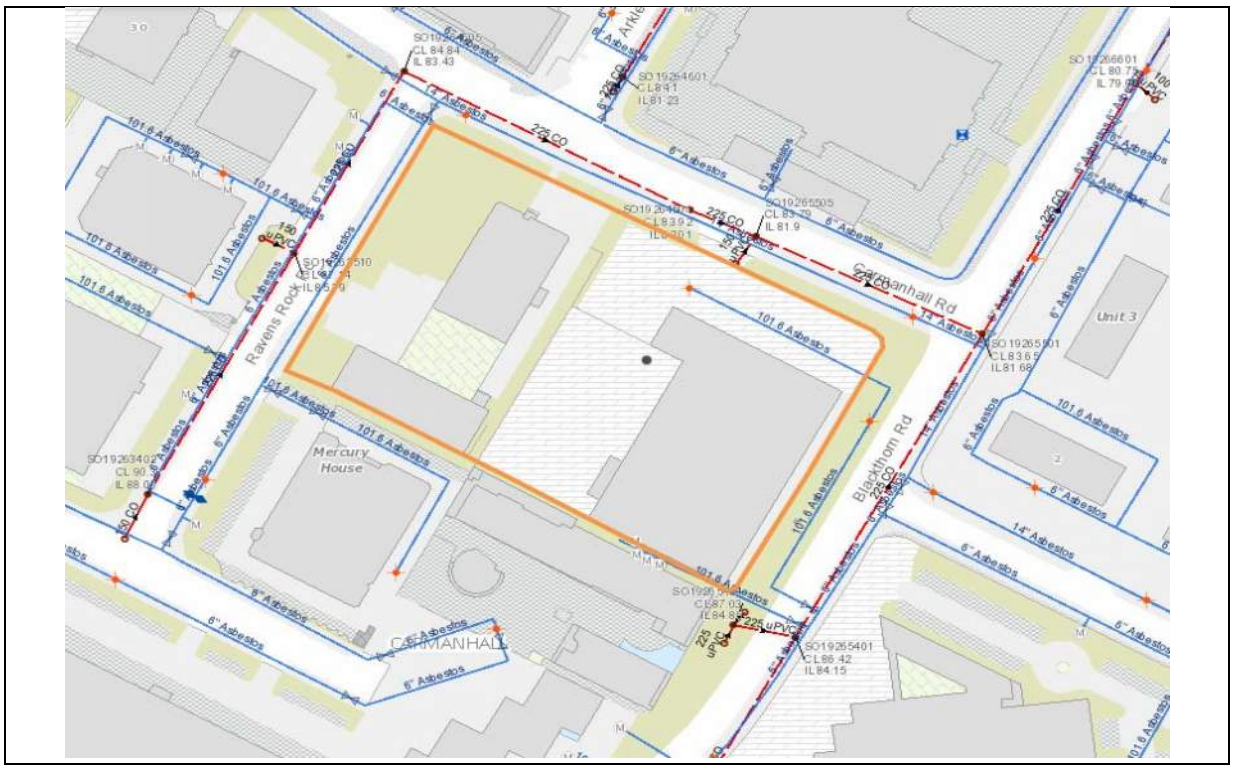
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Ravens Rock Road, Sandyford, Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	This Confirmation of Feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. Please note that Irish Water cannot guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development Connection is feasible to the 14” Asbestos main (Green in below screenshot) to the North of the site. A bulk meter is to be installed on this connection.

	A second connection is feasible to the 6” Asbestos main (Red in below screenshot) to the East of the site. A control valve is to be placed on this main allowing for this connection to be set to closed during normal operations. 
Wastewater Connection	Separate storm and foul water connection services have to be provided for the Development. The surface and storm water from the site must be discharged only into an existing storm water network that does not discharge to an IW combined/foul sewer. The connection arrangement should be agreed with the Local Authority Drainage Division. The connection has to be made to the Arkle Road (MH: SO19264601) network as shown below. A second connection to other sewers adjacent to the site are not feasible based on current constraints in the downstream network. 

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

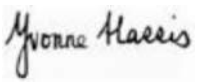
General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.

3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Kevin McManmon from the design team at kmcmanmon@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

C. Site Investigation Avid Site

PROPOSED DEVELOPMENT
SANDYFORD DUBLIN
MARLET PROPERTY

AECOM
CONSULTING ENGINEERS

CONTENTS

APPENDICES

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater.

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION
AT
FORMER AVID SITE

SANDYFORD
FOR

MARLET PROPERTY GROUP
AECOM CONSULTING ENGINEERS

Report No. 22455 **JUNE 2020**

I Introduction

A new multi-storey residential development is proposed for this site located at the junction of Blackthorn Road and Carmanhall Road in Sandyford. The site was formerly occupied by AVID, the old buildings have all been demolished and the area prepared for this new development.

An investigation of sub soil conditions in the developments area has been carried out by IGSL under the direction of AECOM Consulting Engineers, acting for the developers, MARLET Property Group.

The scope of works scheduled and completed is detailed below:

*	Cable Percussion Boreholes	4 nr.
•	Rotary Core Drilling	2 nr.
•	Trial Pits	12 nr.
•	CBR by Plate Test	1 nr.
•	Infiltration Test	2 nr.
•	Water and Gas Monitoring	
•	Geotechnical Laboratory Tests	
•	Environmental Laboratory Tests	

The investigation has been carried out in accordance with the various standards outlined in the foreword to this document. Field operations were completed in March 2020.

This report includes all factual data from field operations and laboratory including detailed geotechnical logs and laboratory data.

Recommendations for foundation construction are also presented in this report.

II Fieldwork

The development area is Brownfield following demolition of buildings and site preparation works. The surfaces ranged from hard-core fill to tarmac and topsoil.

The various exploratory locations are noted on the drawing enclosed in Appendix VII. This drawing was provided by AECOM. Each location was set out to the specified co-ordinates by IGSL site personnel.

All exploratory positions were scanned electronically (CAT) to ensure that existing services were not damaged. Hand excavation was also carried out to a depth of 1.00 metres at borehole locations to ensure that underground services were not damaged.

The various exploratory methods are discussed in the following paragraphs.

Boreholes

Boreholes were 200mm diameter and were constructed using conventional cable percussion equipment. Holes were referenced BH01 to BH04 and were located at the four corners of the site

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement. It was not possible to recover undisturbed samples because of the high stone/cobble content of the strata encountered.

The findings at the four locations are quite consistent. Surface FILL extends to depths ranging from 1.00 to 1.90 metres.

In all four boreholes stiff to very stiff brown and grey sandy gravelly CLAY is present below the FILL Boreholes continued in this stratum to refusal on obstructions at depths ranging from 7.30 to 11.20 metres. An increasing strength with penetration depth has been noted. Cobbles and boulders were present in the gravelly clay stratum.

This gravelly clay is GLACIAL TILL or BOULDER CLAY, very typical of the greater Dublin area.

BH02 and BH04 were dry during boring while slow to moderate water seepages were noted at 3.30 metres in BH01 and 3.10 metres in BH03. Slotted standpipes were installed in BH01 and BH02 to facilitate long term observation of ground water and permit measurement of any gas present.

Rotary Core Drilling

Rotary core drilling was scheduled at two locations to advance hole depth and establish bedrock horizon. These holes were bored through the boulder clay deposits to the underlying granite bedrock. Rotary holes were designated RC02 and RC04.

A GEO405 rig was used to drill and recover 78mm diameter core of rock using triple tube diamond drilling technique. Open-hole Symmetrix Drilling was used in the overburden soils

All recovered core was returned to the laboratory for detailed logging and photography. The geotechnical core logs are contained in Appendix II. The logs note Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) as well as presenting a fracture spacing log and detailed geological description.

The drilling was advanced through overburden described as stiff brown and black very gravelly clay with cobbles and boulders throughout.

Weak to Medium Strong grey GRANITE was noted in RC02 at 8.70 metres BGL and 100% core was recovered from 8.70 to 11.70 metres. This core was quite fractured with low SCR and RQD values.

At RC04 very weathered GRANITE was noted at 11.10 metres BGL. Drilling continued to 14.80 metres with only limited recovery of solid core in this location.

Sub samples of the recovered core were taken and sent to the materials laboratory for Point Load Strength Tests.

A 50mm slotted PVC standpipe was installed in both locations with gravel surround and surface seal, details of the installations are provided on the drilling record. Water was noted at final standing levels of 2.20 and 1.32 metres BGL .

Trial Pits

Trial Pits were excavated at twelve locations to establish stratification and permit sample recovery for environmental analysis. Trial Pits are referenced TP01 to TP12 and fully detailed records are presented in Appendix III. Photographs were also taken at each trial pit and these are also attached for record purposes.

The pits reflect a very high degree of consistency with FILL in all locations (varying from 0.30 to 1.20 metres in thickness) overlying stiff to very stiff BOULDER CLAY. All trial pits were completed at 3.00 metres and no ground water was encountered during the course of the investigation, other than a minor seepage at 2.00 metres in TP01. Excavations remained stable throughout.

Trial Pits were backfilled with compacted excavated material and the areas levelled.

Plate Bearing Test

The CBR value of the soil at shallow depth was established at one locations using Plate Bearing Test Apparatus. A steel plate is loaded and off-loaded incrementally over two stages and the deflection under load and recovery under off-load is measured by a system of dial gauges. The data is processed and load settlement graphs are prepared. An equivalent CBR value is calculated in accordance with NRA HD25-26/10.

The test was carried out at 0.50 metres on MADE GROUND. An equivalent CBR value of 10% was obtained on the Load Cycle, increasing considerably on re-load.

Test data sheets are presented in Appendix IV.

Infiltration Tests

Two infiltration tests were carried out in accordance with BRE Digest 365 in the specified locations. Test data is presented in Appendix V.

In both locations no fall in water table was noted over the specified period and a ZERO Infiltration Rate was recorded. The results are typical of the very low permeability boulder clays present on the site and in the general area.

The use of the local authority drainage system for disposal of storm and surface water is therefore recommended.

Water and Gas Monitoring

Standpipes were installed in four locations to facilitate long term monitoring of ground water levels and determine gas concentrations. Measurements were carried out at intervals following site completion.

Details are presented in Appendix VIc. Final standing water level has stabilised at approximately 2.00 metres BGL.

Concentrations of CO2, O2, and CH4 are negligible and no safety issues arise in this regard.

III. Testing

a) In-Situ :

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. Tests were also carried out in the rotary holes. N values are noted in the right hand column of the individual records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows. Where full test penetration was not achieved the blow count for a specific penetration is recorded, or refusal is indicated where appropriate. Results are summarised as follows.

Stratum / Depth	N Value Range	Comment
FILL DEPOSITS	14 to 17	Medium Dense
BOULDER CLAY		
2.00 metres BGL	21 to 32	Stiff
3.00 metres BGL	18 to 32	Stiff
4.00 metres BGL	28 to 43	Stiff to Very Stiff
5.00 metres BGL	35 to 42	Very Stiff
6.00 metres BGL	36 to 43	Very Stiff
7.00 metres BGL	39 to +50	Very Stiff to Hard
8.00 to 10.00	40 to +50	Very Stiff to Hard

Refusal of SPT apparatus was recorded at the base of each borehole possibly indicative of the granite bedrock horizon.

(b) Laboratory :

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical soil and rock testing was carried out by IGSL in its INAB-Accredited laboratory. Chemical testing was performed by CHEMTEST in a UKAS accredited laboratory.

The overall test programme included the following elements:

*	Moisture Content	IGSL
•	Liquid and Plastic Limits	IGSL
•	PSD Grading by wet sieve	IGSL
•	PSD Grading by Hydrometer	IGSL
•	Point Load Test on Rock Core	IGSL
•	Sulphate Chloride and pH	CHEMTEST
•	RILTA Suite Environmental	CHEMTEST

All test data is presented in Appendices VIa and VIb. and individual test results are discussed as follows:

Classification / Moisture Content

Six samples of the gravelly CLAY stratum from the boreholes had index properties established. Results consistently fall into Zone CL of the standard Classification, indicative of low plasticity sensitive clay matrix soils. Moisture content for the samples ranges from 11% to 17%. Results are typical of the local boulder clay.

Grading

Wet sieve analysis and hydrometer was used to establish PSD grading curves for four samples of the glacial till. The graphs reflect material graded smoothly from the clay to gravel fraction, the straight-line pattern of the graphs is typical of the local boulder clay deposition.

Point Load Test

The strength of the limestone bedrock has been established by Diametric Point Load Tests on four segments of core. Equivalent UCS values ranging from 4 to 40 MPa with an average UCS value of 23 MPa. The low results reflect the highly weathered and weak nature of the bedrock.

Chemical (BRE SOI Suite)

Five soil samples were selected for sulphate, Chloride and pH analysis. Sulphate concentrations (SO4 2:1 extract) of < 0.010 g/l were established with pH values of 8.4 to 8.7. Chloride contents were also consistently low <0.010 g/l. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for sulphate concentrations less than 0.5 g/l. No special precautions are therefore required to protect foundation concrete from sulphate or chloride aggression.

RILTA Suite Environmental

Sixteen samples of the MADE GROUND taken at 0.50 to 1.00 metre from each trial pit were submitted for detailed analysis to RILTA Suite (WAC) parameters.

Fifteen of the sixteen samples are classified as INERT with no elevated contaminant levels established.

In one sample however (TP05 @ 0.50m BGL) an elevated sulphate content was recorded, in excess of the permitted INERT limit. The remaining levels recorded in this sample were all below the INERT levels.

No traces of Asbestos were noted during routine screening.

IV Discussion:

A new multi-storey residential development is to be undertaken on this site in Sandyford. The nine-storey building will incorporate a single storey basement car park. A formation depth some 3.50 to 4.00 metres BGL is envisaged.

A detailed investigation of sub soil and bedrock conditions has been carried out under the direction of AECOM Consulting Engineers on behalf of MARLET Property Group.

Summary Stratification

The findings are very consistent and confirm the presence of shallow surface FILL over BOULDER CLAY deposits with GRANITE bedrock encountered at depth between approximately 9.00 and 11.00 metres.

The FILL extends to a maximum depth of about 1.50 metres and is firm or medium dense in situ, with N values in the range 14 to 17 and an in situ CBR value of 10%.

The BOULDER CLAY or glacial till comprises stiff to hard brown, grey and black sandy gravelly CLAY typically containing cobbles and boulders. SPT values increase with depth from about N=20 at 2.00 metres BGL to N > 50 below 7.00 metres.

The characteristics of the Dublin boulder clay are very well documented and the laboratory data for this site is consistent with the published data.

Ground water seepages were noted in several locations and long term water observations in standpipes indicates a final standing level of about 1.50 metres BGL for this site.

Variation in the general grading pattern of the till can occur, with an elevated granular content and increased moisture content often identified. Bands of water bearing clayey gravel can also typically occur within the generally cohesive soils.

Proposed Development

With regard to the proposed development (incorporating multi-storey construction over basement) the following geotechnical issues are discussed.

- Foundations / Bearing Capacity
- Piling
- Basement Construction
- Excavation / Ground Retention
- Groundwater Control / Uplift

Foundations / Bearing Capacity

At an assumed basement formation depth of 4.00 metres BGL, the sub soils consist of very stiff to hard dark brown or grey gravelly CLAY (Boulder Clay). SPT values at this depth range from N=28 to N=43 with an average value of N=36.

The boulder clay at 4.00 metres BGL should readily support an allowable bearing pressure of the order of 325 KPa for basement slab or column base construction.

N values at 5.00 metre BGL show an increase, with an allowable bearing pressure of the order of 375 KPa recommended at this depth.

The characteristics of the local boulder clay are well documented with numerous publications detailing behavioural and strength / settlement characteristics. The field and laboratory findings from this site are consistent with the extensive local data. The boulder clay will be sensitive to moisture content variation and should be protected from rainfall by blinding. Visual inspection of excavated formation by experienced personnel is also recommended to ensure uniformity and suitability of the founding medium. Any soft zones encountered should be removed and replaced with low-grade concrete.

Settlement in the very stiff to hard glacial till under the above loads should not exceed 5mm and differential movement should be negligible.

Piling

Should direct excavation to a suitable bearing stratum prove uneconomic from either an engineering or environmental viewpoint, the use of piling techniques can be considered.

Various piling techniques are available with specialist contractors, experienced in local ground conditions available to provide this service.

The stiff to hard black till encountered at about 2.00 metres extends to bedrock horizon at about 10.00 metres and can be used as founding medium for light to moderately loaded piles.

For multi-storey structures with high column loads it is likely that large diameter piles, rock socketed into the granite bedrock will be required.

Proof core drilling has indicated the presence of highly weathered non-intact granite at the soil rock interface, in excess of 3.00 metres in places.

Piling contractors should be consulted to determine the optimum solution for this site, having regard to the geotechnical data and to any possible environmental restraints.

Basement Construction

As a basement will be incorporated over the full footprint the very stiff to hard lodgement till at approximately 3.50 to 4.00 metres BGL is recommended as founding medium with an allowable bearing pressure of 300 to 350 KPa indicated by SPT values averaging N=36.

Settlement under this intensity of load will be low (< 5mm) and differential settlement will be negligible.

Excavation / Ground Retention

Assuming 4.00 metre deep basement construction a retaining wall structure will probably be required to support the soils, prevent undermining of sensitive adjoining buildings or roadways and preclude ground water ingress.

A number of ground retention techniques are available and each should be fully evaluated. These include the following:

- Steel Sheet Pile Wall
- Secant Pile Wall
- King Post Wall

Specialist contractors with will advise on the most suitable and economic option for this development.

Groundwater

Water ingress was noted in two of the boreholes at approximately 3.00 metres. The inflow was slight to moderate and control of ground water in basement excavation should be readily achieved by conventional pumping from local sumps.

Long-term water observation in standpipes has indicated a final standing level at approximately 2.00 metres BGL and this figure should be adopted in design against uplift.

Roads / Car Parking

A CBR value of 10% was obtained at 0.50 metres BG in the upper medium dense FILL. This should be suitable for pavement design. Visual inspection of pavement formation is recommended to ensure that all suspect or organic material is removed prior to construction.

Infiltration

Two percolation tests to BRE Digest 365 confirmed that the soils are unsuitable for dispersion of storm and surface water. The Local Authority drainage system should be utilised.

Environmental

The results of WAC analyses showed that one sample failed to satisfy the criteria for Inert waste as stipulated by the European Landfill Directive. The fact that only one element of one test out of sixteen analysed exceeded the INERT level, suggests that consultation with landfill operators may well result in acceptance of excavated material from this site.

The results of the RILTA Suite tests can be used to carry out a full Waste Characterisation Assessment (WCA). This assessment is carried out by an environmental specialist and determines whether the soils are Hazardous or Non-Hazardous in advance of being despatched to landfill. Given the test results a WCA may be relevant to this site and may be required by the landfill operators in the event of major excavation.

Concrete

Low sulphate and chloride contents were established with near neutral pH values. No special precautions are deemed necessary to protect foundation concrete.

IGSL/JC
June 2020

Appendix I Boring Records

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH1
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	7.30
		DATE COMMENCED	24/03/2020
		DATE COMPLETED	25/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.20						
	MADE GROUND (comprised of angular broken rock fill)			0.60						
	MADE GROUND (Comprised of gravelly clay with some stone)			1.00						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel and occasional cobbles				AA135559	B	1.00		N = 17 (6, 7, 4, 4, 4, 5)	
2					AA135560	B	2.00		N = 21 (4, 4, 5, 5, 5, 6)	
				2.50						
	Stiff, dark grey, sandy silty gravelly CLAY with occasional cobbles									
3					AA135561	B	3.00		N = 36 (4, 5, 6, 6, 7, 7)	
4					AA135562	B	4.00		N = 33 (6, 7, 7, 9, 8, 10)	
				4.30						
	Very stiff, brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders									
5					AA135563	B	5.00		N = 35 (4, 6, 7, 8, 8, 12)	
6					AA135564	B	6.00		N = 40 (7, 8, 8, 9, 11, 12)	
7					AA135565	B	7.00		N = 50/40 mm (25, 50)	
				7.30						
	Obstruction End of Borehole at 7.30 m									
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.8	5.1	0.75	
7.2	7.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.80	3.80	5.00	1.70	20	Moderate

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
25-03-20	7.30	1.00	7.00	50mm SP

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 29/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH2
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	8.50
		DATE COMMENCED	26/03/2020
		DATE COMPLETED	27/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.05						
	Firm, dark brown, sandy silty CLAY with occasional gravel and cobbles (Possibly Made Ground)				SPL1	B	1.00		N = 16 (2, 2, 4, 3, 5, 4)	
				1.90						
2	Stiff to very stiff , dark grey, sandy gravelly silty CLAY with cobbles				SPL2	B	2.00		N = 23 (4, 5, 5, 5, 6, 7)	
3					SPL3	B	3.00		N = 32 (5, 7, 7, 8, 8, 9)	
				3.60						
4	Very stiff, light brown, very sandy CLAY with some gravel				SPL4	B	4.00		N = 43 (6, 8, 10, 10, 11, 12)	
5					SPL5	B	5.00		N = 42 (9, 10, 10, 10, 11, 11)	
				5.40						
6	Very stiff to hard , grey and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders				SPL6	B	6.00		N = 44 (8, 9, 9, 10, 11, 14)	
7					SPL7	B	7.00		N = 39 (6, 8, 8, 9, 10, 12)	
8					SPL8	B	8.20		N = 50/75 mm (12, 18, 32, 18)	
				8.50						
9	Obstruction End of Borehole at 8.50 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.7	4.9	1.25	
8.3	8.5	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
27-03-20	8.50	1.00	8.50	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
27-03-20	5.40	5.40	0.30	

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 28/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH3
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	8.30
		DATE COMMENCED	23/03/2020
		DATE COMPLETED	24/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	MADE GROUND (Comprised of brown sandy gravelly clay fill with some brick and concrete fragments)			1.20	AA135561	B	1.00		N = 14 (2, 2, 3, 3, 4, 4)	
2	Stiff grey/brown sandy silty CLAY with some gravel and occasional cobbles				AA135562	B	2.00		N = 20 (3, 4, 4, 5, 6, 5)	
3					AA135563	B	3.00		N = 18 (2, 4, 5, 5, 4, 4)	
				3.90						
4	Very stiff dark brown gravelly CLAY				AA135564	B	4.00		N = 50/210 mm (8, 14, 14, 20, 16)	
5					AA135565	B	5.00		N = 35 (5, 6, 6, 8, 9, 10)	
6					AA135566	B	6.00		N = 36 (6, 7, 7, 8, 10, 11)	
				6.40						
7	Very stiff, brown and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders				AA135567	B	7.00		N = 40 (7, 8, 10, 10, 9, 11)	
8					AA135568	B	8.00		N = 50/75 mm (10, 14, 46, 4)	
				8.30						
9	Obstruction End of Borehole at 8.30 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.2	4.5	1	
8	8.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.10	3.10	4.20	1.60	20	Moderate

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 29/5/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH4
		SHEET	Sheet 1 of 2
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	11.20
		DATE COMMENCED	20/03/2020
		DATE COMPLETED	23/03/2020
CLIENT	Marlet	SPT HAMMER REF. NO.	
ENGINEER	AECOM	ENERGY RATIO (%)	
		BORED BY	W.Cahill
		PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel (Possibly Made Ground)			1.80	AA130581	B	1.00		N = 17 (2, 3, 4, 4, 4, 5)	
2	Very stiff, dark brown/black, sandy silty gravelly CLAY			3.10	AA130582	B	2.00		N = 32 (5, 6, 5, 8, 7, 9)	
3	Stiff, dark brown, very sandy gravelly CLAY with some cobbles			4.20	AA130583	B	3.00		N = 24 (3, 4, 4, 6, 7, 7)	
4	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders				AA130584	B	4.00		N = 28 (4, 5, 5, 7, 7, 8)	
5					AA130585	B	5.00		N = 35 (6, 8, 8, 9, 9, 9)	
6					AA130586	B	6.00		N = 43 (5, 8, 10, 10, 11, 12)	
7					AA130587	B	7.00		N = 42 (7, 9, 9, 10, 12, 11)	
8					AA130588	B	8.00		N = 41 (6, 7, 9, 11, 10, 11)	
9					AA130589	B	9.00		N = 43 (7, 9, 10, 11, 10, 12)	

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
2.3	2.5	1.25	
6.4	6.7	0.75	
10.9	11.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
20-03-20	4.50	4.50	DRY	
23-03-20	4.50	4.50	1.70	

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 23455.GPJ IGSL.GDT 25/6/20

GEOTECHNICAL BORING RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	BOREHOLE NO.	BH4
		SHEET	Sheet 2 of 2
CO-ORDINATES	RIG TYPE Dando 2000	DATE COMMENCED	20/03/2020
GROUND LEVEL (m AOD)	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED	23/03/2020
	BOREHOLE DEPTH (m) 11.20		
CLIENT Marlet	SPT HAMMER REF. NO.	BORED BY	W.Cahill
ENGINEER AECOM	ENERGY RATIO (%)	PROCESSED BY	I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
10	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders *(continued)*				AA120580	B	10.00		N = 46 (8, 8, 10, 10, 12, 14)	
11				11.20	AA120581	B	11.00		N = 50/95 mm (13, 12, 27, 23)	
	Obstruction End of Borehole at 11.20 m									
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
2.3	2.5	1.25	
6.4	6.7	0.75	
10.9	11.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit for services

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U/T - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 22455.GPJ IGSL.GDT 26/5/20

Appendix II Rotary Core Records

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	DRILLHOLE NO	RC02
		SHEET	Sheet 1 of 2
CO-ORDINATES		DATE COMMENCED	11/03/2020
GROUND LEVEL (mOD)		DATE COMPLETED	12/03/2020
CLIENT	Marlet	DRILLED BY	IGSL
ENGINEER	AECOM	LOGGED BY	D.O'Shea
RIG TYPE	Geo405		
FLUSH	Air/Mist		
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	76		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.70			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY	1.80			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	2.30			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black gravelly CLAY				
4												
5												
6												
7												
8	8.70							SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	8.10			
9	9.30	100	100	85					8.70			

REMARKS

Hole cased 0.00-8.70m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-03-20	11.70	8.10	11.70	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford
DRILLHOLE NO	RC02
SHEET	Sheet 2 of 2
CO-ORDINATES	
GROUND LEVEL (mOD)	
RIG TYPE	Geo405
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78
DATE COMMENCED	11/03/2020
DATE COMPLETED	12/03/2020
CLIENT	Marlet
ENGINEER	AECOM
DRILLED BY	IGSL
LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10		100	0	0				Medium strong (where competent) to predominantly weak, massive to structureless, crystalline, grey/black/white mottled, fine to medium-grained, GRANITE, slightly to predominantly highly weathered (contributing to coreloss at 9.90-10.70m, 11.32-11.38m & 11.46-11.70m).				
	10.70							Discontinuities are rough, irregular. Apertures are open, commonly sandy clay-smeared. Dips are irregular. *(continued)*				
11		100	25	19					11.70			
	11.70							End of Borehole at 11.70 m				
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-8.70m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-03-20	11.70	8.10	11.70	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
12-03-20	11.70	8.70	9.03	Water level recorded 10mins after end of drilling

IGSL RC FI 10M 22455.GPJ IGSL.GDT 16/4/20

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford	DRILLHOLE NO	RC04
		SHEET	Sheet 1 of 2
CO-ORDINATES		DATE COMMENCED	10/03/2020
GROUND LEVEL (mOD)		DATE COMPLETED	11/03/2020
CLIENT	Marlet	DRILLED BY	IGSL
ENGINEER	AECOM	LOGGED BY	D.O'Shea
RIG TYPE	Geo405		
FLUSH	Air/Mist		
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.90			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black sandy gravelly CLAY	2.20			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	3.20			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY with occasional cobbles	9.40			
4												
5												
6												
7												
8												
9								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY				

REMARKS

Hole cased 0.00-11.30m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To ↓	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-03-20	14.80	11.10	0.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 22455

CONTRACT	Avid Site, Sandyford
DRILLHOLE NO	RC04
SHEET	Sheet 2 of 2
CO-ORDINATES	
GROUND LEVEL (mOD)	
RIG TYPE	Geo405
FLUSH	Air/Mist
INCLINATION (deg)	-90
CORE DIAMETER (mm)	78
DATE COMMENCED	10/03/2020
DATE COMPLETED	11/03/2020
CLIENT	Marlet
ENGINEER	AECOM
DRILLED BY	IGSL
LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	10.10			
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	11.10			
12	12.60								12.60			
13		32	10	0				Probable Weathered ROCK - recovered as sandy gravelly cobbles of GRANITE - Non intact				
14	14.80								14.80			
15								End of Borehole at 14.80 m				
16												
17												
18												
19												

REMARKS

Hole cased 0.00-11.30m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

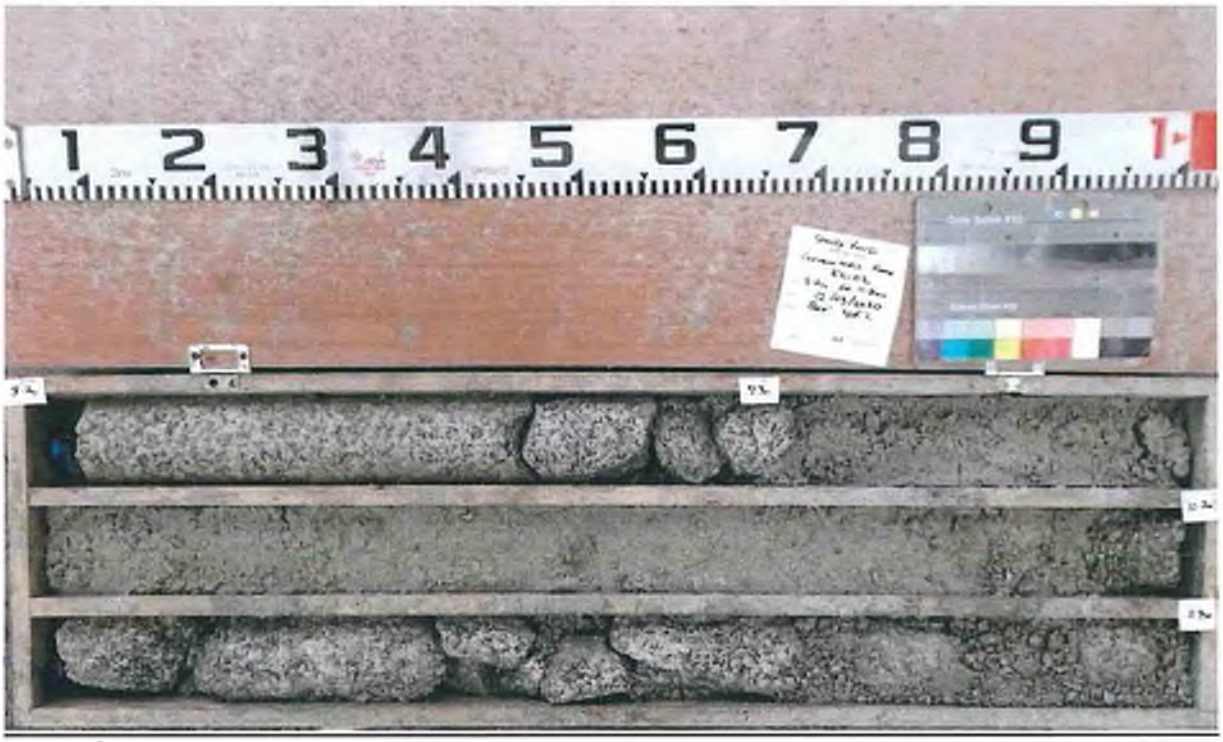
Date	Tip Depth	RZ Top	RZ Base	Type
11-03-20	14.80	11.10	0.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-03-20	14.80	11.30	1.80	Water level recorded 10mins after end of drilling

IGSL RC FI 10M 22455.GPJ IGSL.GDT 16/4/20

RC02 – Box 1 of 1 – 8.70-11.70m



RC04 – Box 1 of 1 – 12.60-14.80m

Appendix III Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp01
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
	CO-ORDINATES	DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Tar		0.10							
MADE GROUND - Dense sandy gravel. Gravels are fine to coarse and angular to sub rounded.		0.30							
MADE GROUND - Dense gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.50			AA131830	B	0.50		
Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded. Possible made ground.		1.10			AA131831	B	1.00		
Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131832	B	2.00		
Stiff - very stiff dark grey slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50			AA131833	B	2.80		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Seepage at 2 m.

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin
TRIAL PIT NO.	Tp02
SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon
CO-ORDINATES	
DATE STARTED	10/03/2020
DATE COMPLETED	10/03/2020
GROUND LEVEL (m)	
CLIENT	Marlet Property Groupd
ENGINEER	Aecom
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.		0.40							
Firm - stiff dark brown slightly silty gravelly CLAY. Gravels are fine to coarse and angular to sub rounded. Possible made ground.					AA131634	B	0.50		
Stiff dark brown very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA131635	B	1.10		
					AA131636	B	2.20		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.80							
End of Trial Pit at 3.00m		3.00			AA1318337	B	3.00		

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 20/5/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp03
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
	CO-ORDINATES	DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - Stiff brown very gravelly clay with rare plastic and metal pieces and high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131838	B	0.50		
1.0 Stiff dark brown gravelly CLAY with low cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.90			AA131839	B	1.00		
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.40			AA131840	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00			AA131841	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp04
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	10/03/2020
		DATE COMPLETED	10/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		

CO-ORDINATES

GROUND LEVEL (m)

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.									
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.50			AA131842	B	0.50		
1.0 Stiff dark brown very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.00			AA131843	B	1.00		
2.0 Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA131844	B	2.00		
					AA131845	B	2.80		
3.0 End of Trial Pit at 3.00m		3.00							
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp05
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
		DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	CO-ORDINATES		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND very dense very gravelly sand with occasional red brick metal plastic and concrete pieces and high cobble content and medium boulder content.					AA131846	B	0.50		
1.0 Stiff dark brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.20			AA131847	B	1.20		
2.0					AA131848	B	2.00		
Stiff - very stiff dark grey gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.70							
3.0 End of Trial Pit at 3.00m		3.00			AA131849	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp06
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND very gravelly sand with high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.					AA131850	B	0.50		
1.0 Stiff slightly sandy very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA136803	B	1.10		
2.0					AA136804	B	2.00		
Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.70							
3.0 End of Trial Pit at 3.00m		3.00			AA136805	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp07
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Tar		0.10							
MADE GROUND - very sandy gravel with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.40							
Stiff dark brown slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.60			AA136806	B	0.50		
Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136807	B	1.00		
					AA136808	B	2.00		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50							
End of Trial Pit at 3.00m		3.00			AA136809	B	3.00		

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 3345.GPJ IGSL.GDT 25/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp08
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom	GROUND LEVEL (m)	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - Tar		0.10							
MADE GROUND - Dense very sandy gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.		0.30							
Stiff light brown slightly sandy very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.70			AA136810	B	0.50		
Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136811	B	1.00		
2.0 Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA136812	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00			AA136813	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 3345.GPJ IGSLGDT 3/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp09
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Dense very sandy very gravelly clay with plastic concrete and metal pieces and a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.		0.50							
Stiff light brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136814	B	0.50		
					AA136815	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.50							
					AA136816	B	2.00		
					AA136817	B	2.50		
End of Trial Pit at 3.00m		3.00							

0.0
1.0
2.0
3.0
4.0

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp10
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
	GROUND LEVEL (m)		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (kPa)	Hand Penetrometer (kPa)
MADE GROUND - very sandy gravel with medium cobble content. Gravels are fine to coarse and angular to sub rounded.		0.10							
Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.					AA136818	B	0.50		
Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.70			AA136819	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.80			AA136820	B	2.00		
					AA136821	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp11
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
		DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom		
CO-ORDINATES			
GROUND LEVEL (m)			

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND - Dense very sandy gravel with a medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.10							
Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.		0.50			AA136822	B	0.50		
Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136823	B	1.00		
Stiff - very stiff dark grey very gravelly CLAY with high cobble content and low boulder content . Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.80			AA136824	B	2.00		
					AA136825	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 20/3/20

TRIAL PIT RECORD

REPORT NUMBER 22455

CONTRACT	Avid Residential Development - Avid Site , Sandyford , Dublin	TRIAL PIT NO.	Tp12
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	DATE STARTED	11/03/2020
	CO-ORDINATES	DATE COMPLETED	11/03/2020
CLIENT	Marlet Property Groupd	EXCAVATION METHOD	JCB
ENGINEER	Aecom	GROUND LEVEL (m)	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
MADE GROUND dense very sandy gravel with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.10							
Stiff brown slightly sandy very gravelly clay with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable Made ground.		0.50			AA136626	B	0.50		
Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136627	B	1.00		
Stiff - very stiff dark grey gravelly CLAY with medium cobble content and high cobble content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.20			AA136628	B	2.00		
Stiff yellowish orange silty gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.20			AA136629	B	2.50		
End of Trial Pit at 3.00m		3.00							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 33/3/20

Appendix IV CBR by Plate Test

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

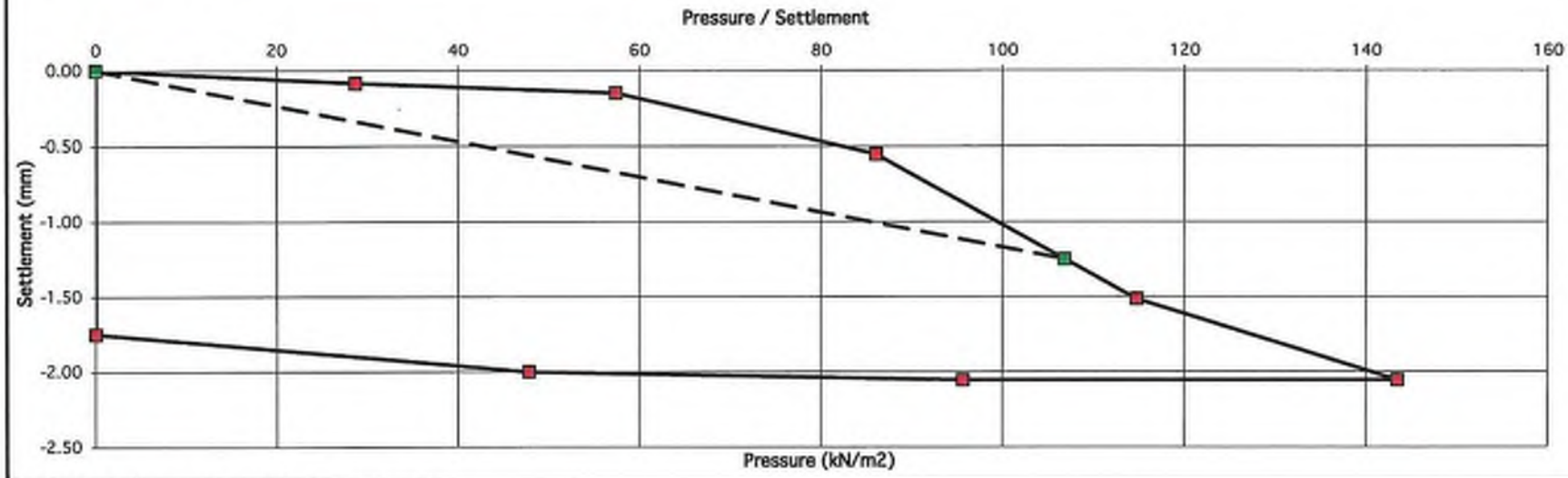
Reference No.	R110689
Contract	Avid site - Sandyford
Test No.	PT1 load
Location	39 carmanhall road
Depth	500 mm
Client	Marlet
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	
Date	10/03/2020

Description of soil under test
(natural soil, placed fill, sub-base)

MADE GROUND very gravelly clay.

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 85

Modulus of subgrade reaction = 55 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 10.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

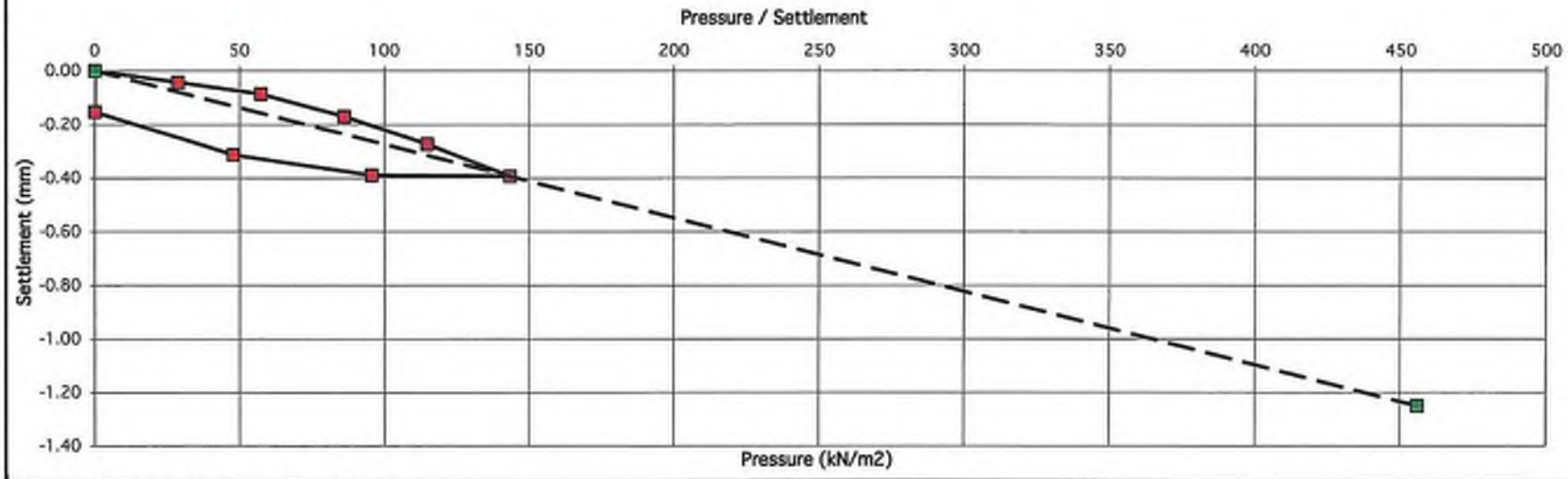
Reference No.	R110689
Contract	Avid site - Sandyford
Test No.	PT1 reload
Location	39 carmanhall road
Depth	500 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	
Date	10/03/2020

Description of soil under test
(natural soil, placed fill, sub-base)

MADE GROUND very gravelly clay.

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 365

Modulus of subgrade reaction = 234 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 123.5 %

Appendix V BRE Digest 365 Tests

Soakaway Design f -value from field tests (F2C) IGSI

Contract: Avid site 1-sandyford Contract No. 22455
Test No. SA01
Client Marlet
Date: 10/03/2020

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	None observed
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

Field Data

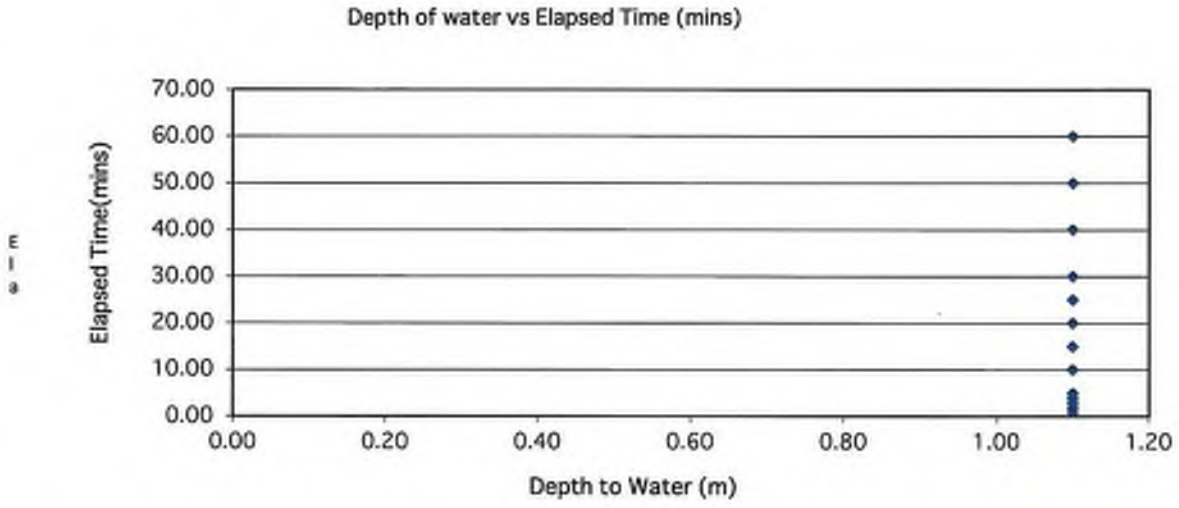
Depth to Water (m)	Elapsed Time (min)
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	10.00
1.10	15.00
1.10	20.00
1.10	25.00
1.10	30.00
1.10	40.00
1.10	50.00
1.10	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.84	m2
Total Exposed area =	2.74	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSI

Contract: Avid site 1-sandyford Contract No. 22455
Test No. SA02
Client Marlet
Date: 10/03/2020

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	None observed
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

Field Data

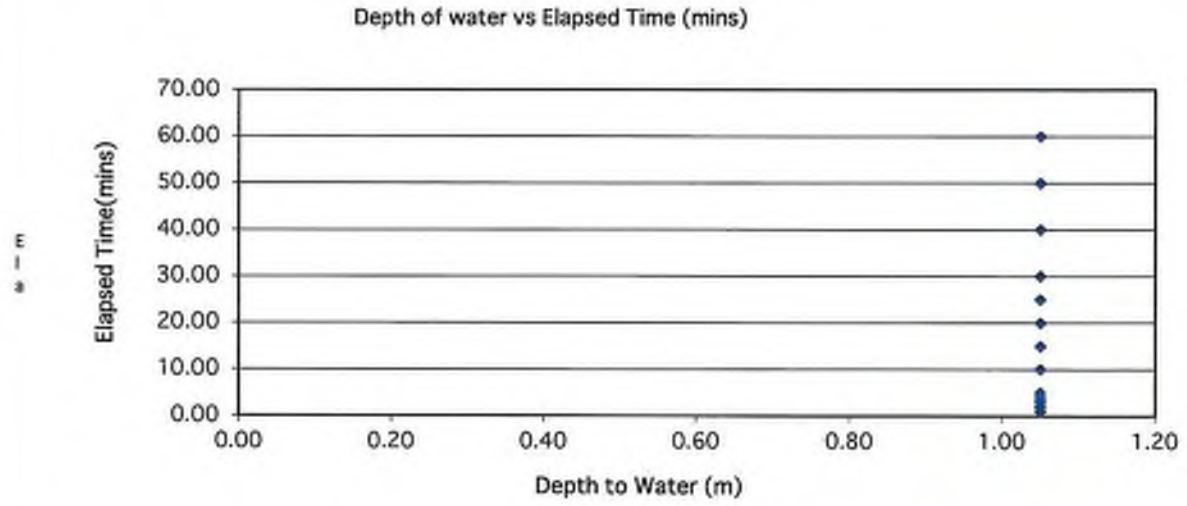
Depth to Water (m)	Elapsed Time (min)
1.05	1.00
1.05	2.00
1.05	3.00
1.05	4.00
1.05	5.00
1.05	10.00
1.05	15.00
1.05	20.00
1.05	25.00
1.05	30.00
1.05	40.00
1.05	50.00
1.05	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.05	m
Final depth to water =	1.05	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.07	m2
Total Exposed area =	2.97	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix VI Laboratory Data

a. Geotechnical Soil and Rock

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

Report No. **R111489** Contract No. 22455 Contract Name: Avid Development Sandyford

Customer Aecom/Marlet

Samples Received: 07/05/20 Date Tested: 22/05/20

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh01	135561	3.0	A20/1674	B	11	30	14	16	59	WS	4.4	C L	Brown sandy gravelly CLAY
Bh02	3	3.0	A20/1676	B	12	29	13	16	47	WS	4.4	C L	Brown sandy gravelly CLAY
Bh03	13553	3.0	A20/1678	B	13	29	12	17	46	WS	4.4	C L	Brown sandy gravelly CLAY
Bh03	13558	8.0	A20/1679	B	16	31	14	17	71	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh04	135083	3.0	A20/1680	B	14	34	16	18	44	WS	4.4	C L	Brown sandy gravelly CLAY
Bh04	130586	6.0	A20/1681	B	17	35	15	20	65	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY

Notes:
Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - Bulk Disturbed; U - Undisturbed

Remarks:
Results apply to the sample as received.
NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by	Date	Page
H Byrne	27/5/20	1 of 1

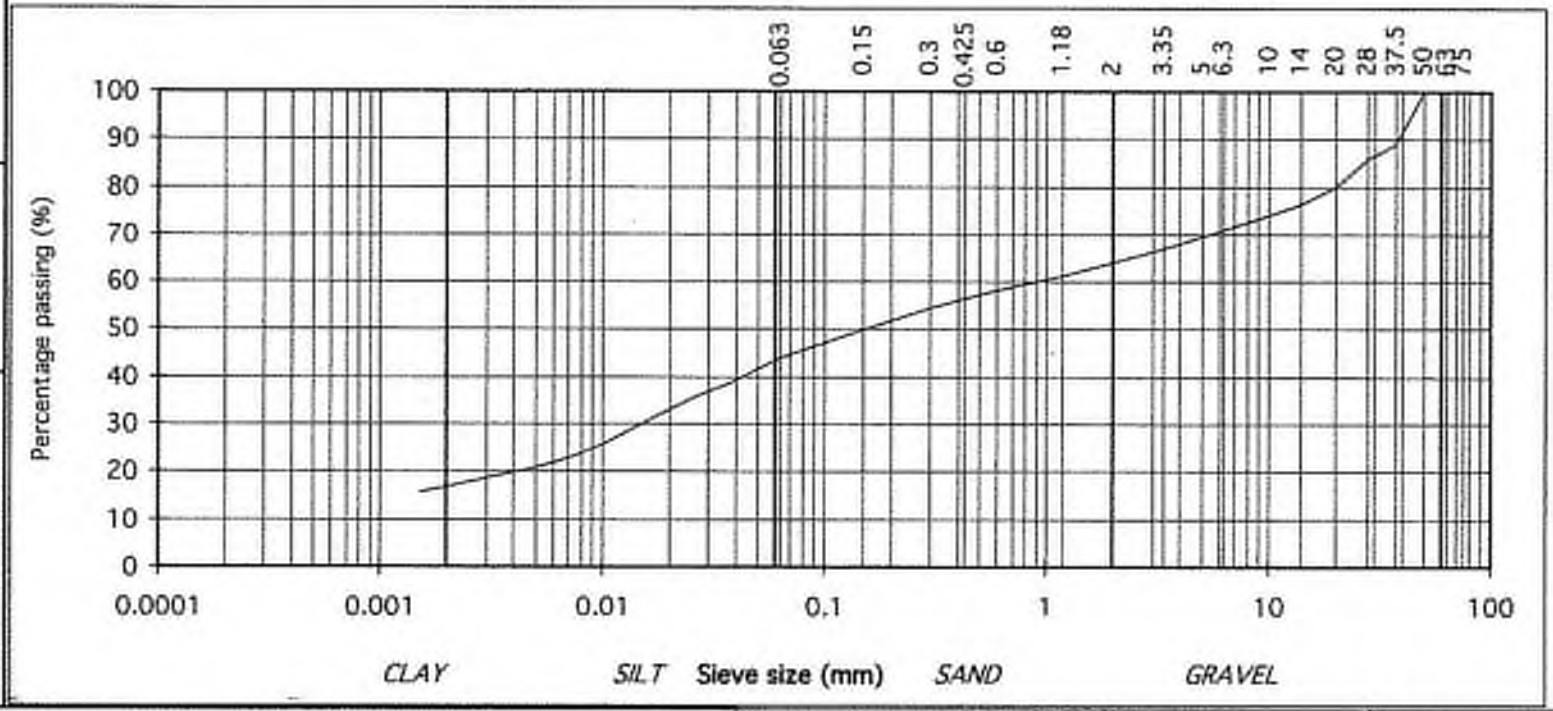
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	89	
28	86	
20	80	
14	76	
10	74	
6.3	71	
5	69	
3.35	67	
2	64	
1.18	61	SAND
0.6	58	
0.425	56	
0.3	54	
0.15	50	
0.063	44	SILT/CLAY
0.037	39	
0.027	36	
0.017	31	
0.010	26	
0.007	23	
0.005	21	
0.002	16	

Contract No: 22455 Report No. R111487
Contract: Avid Development Sandyford
BH/TP : BH01
Sample No. 135564 Lab. Sample No. A20/1675
Sample Type: B
Depth (m) 6.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	82	COBBLES
63	82	
50	82	GRAVEL
37.5	80	
28	80	
20	79	
14	77	
10	74	
6.3	72	
5	70	
3.35	66	
2	62	
1.18	58	SAND
0.6	55	
0.425	53	
0.3	51	
0.15	48	
0.063	44	SILT/CLAY
0.037	39	
0.027	36	
0.017	31	
0.010	26	
0.007	23	
0.005	21	
0.002	16	

Contract No: 22455 Report No. R111488

Contract: Avid Development Sandyford

BH/TP : BH02

Sample No. 7 Lab. Sample No. A20/1677

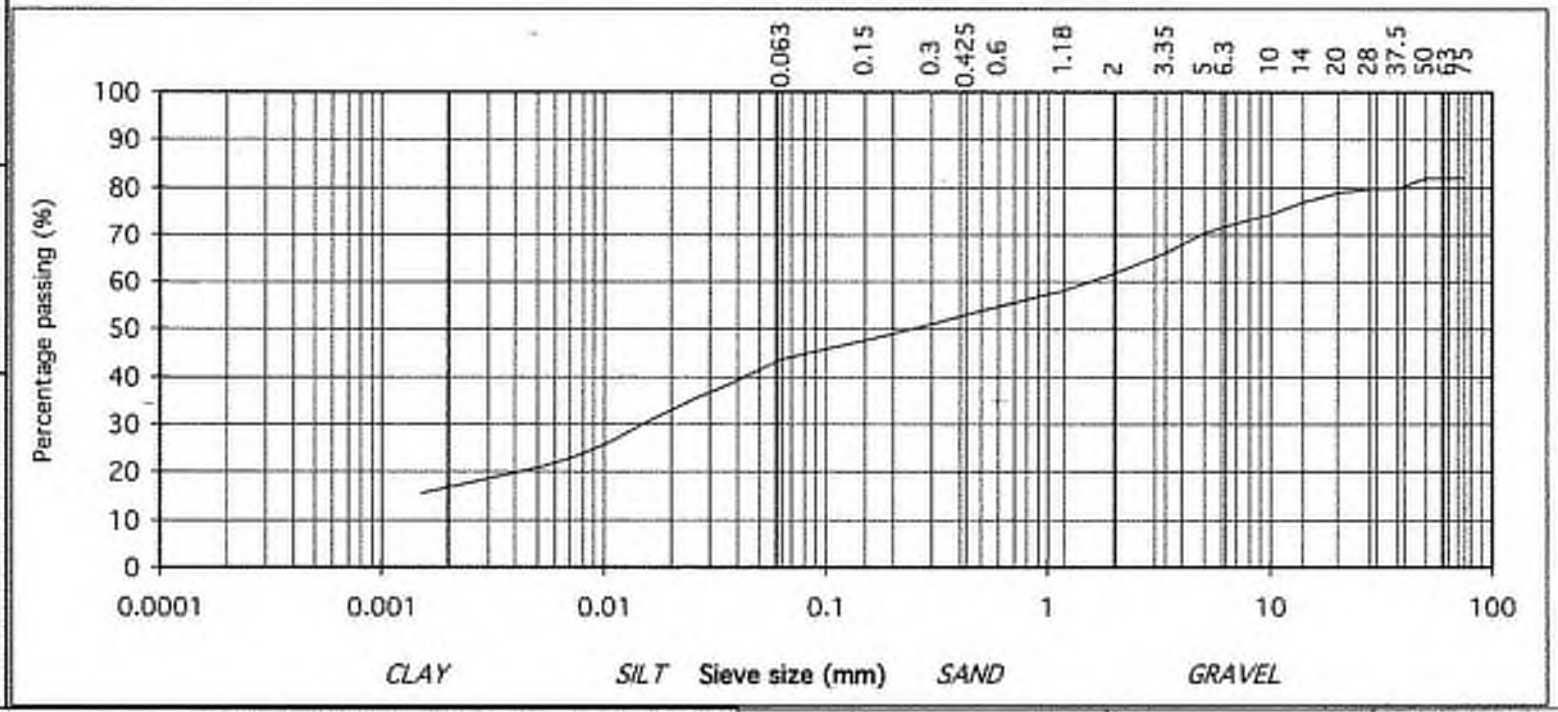
Sample Type: B

Depth (m) 7.00 Customer: Aecom/Marlet

Date Received 07/05/2020 Date Testing started 22/05/2020

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

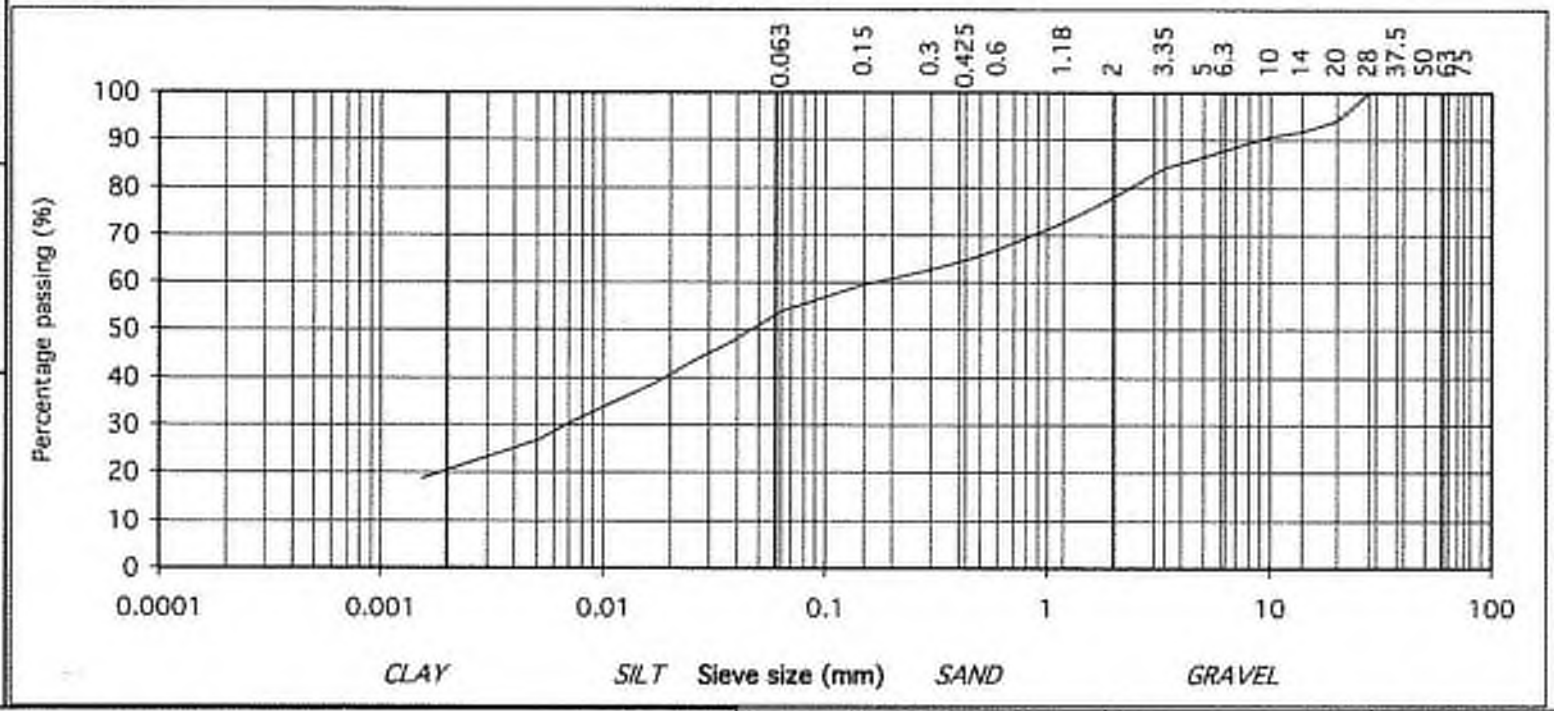
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	94	
14	92	
10	91	
6.3	88	
5	86	
3.35	84	
2	78	
1.18	73	SAND
0.6	67	
0.425	65	
0.3	63	
0.15	60	
0.063	54	SILT/CLAY
0.038	47	
0.027	44	
0.017	39	
0.010	34	
0.007	31	
0.005	27	
0.002	19	

Contract No: 22455 Report No. R111486
Contract: Avid Development Sandyford
BH/TP : BH03
Sample No. 13558 Lab. Sample No. A20/1679
Sample Type: B
Depth (m) 8.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	27/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

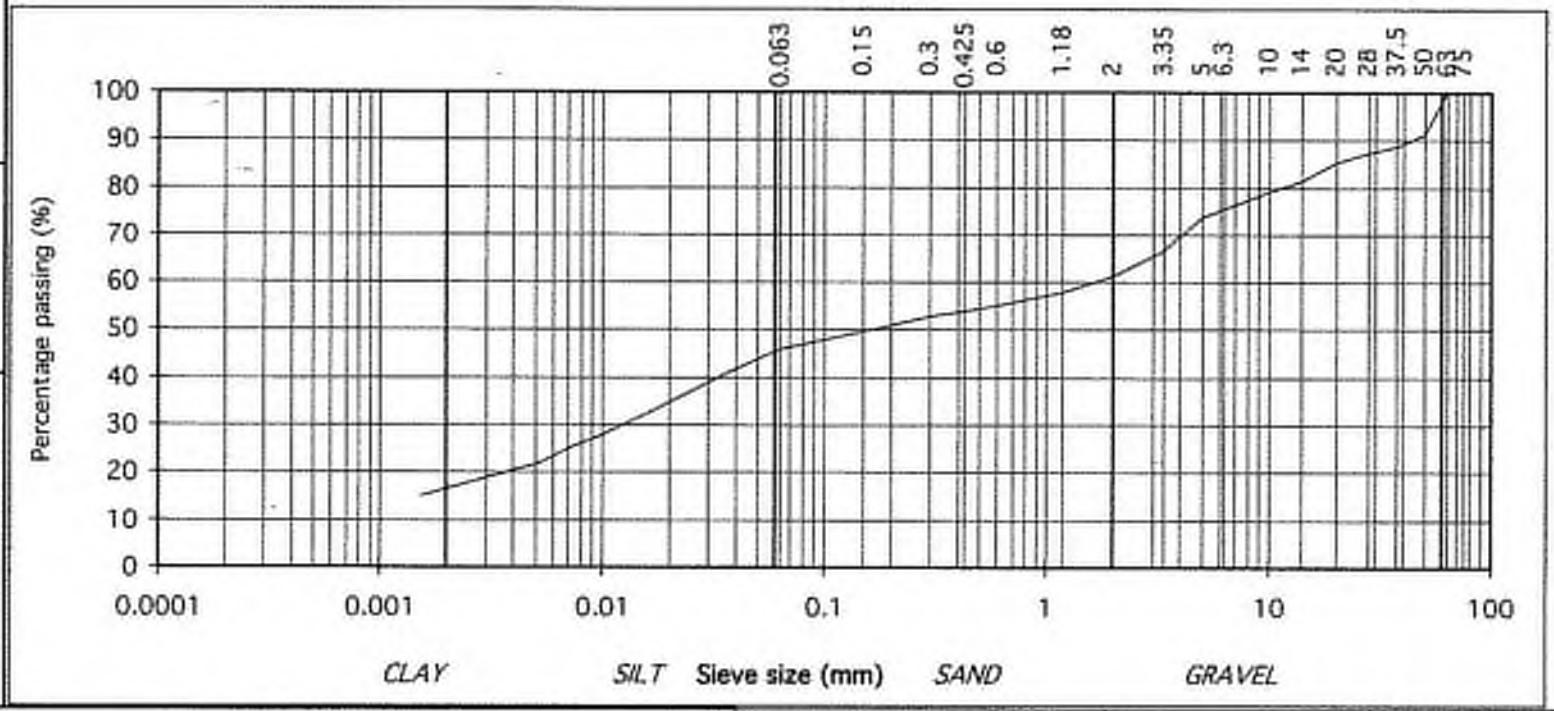
TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	89	
28	87	
20	85	
14	81	
10	79	
6.3	75	
5	74	
3.35	67	
2	61	
1.18	58	SAND
0.6	55	
0.425	54	
0.3	53	
0.15	50	
0.063	46	SILT/CLAY
0.038	41	
0.027	38	
0.017	33	
0.010	28	
0.007	25	
0.005	22	
0.002	15	

Contract No: 22455 Report No. R111490
Contract: Avid Development Sandyford
BH/TP : BH04
Sample No. 130586 Lab. Sample No. A20/1681
Sample Type: B
Depth (m) 6.00 Customer: Aecom/Marlet
Date Received 07/05/2020 Date Testing started 22/05/2020
Description: Brown slightly sandy, gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	28/05/20	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

Contract: Avid Site, Sandyford
Contract no. 22455
Date of test: 16/04/2020

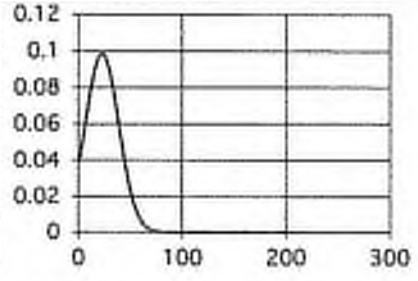
Sample Type: Core

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC02	8.8	76	8.0	1.222	1.31	1.61	32	d	//
	8.9	76	10.0	1.222	1.64	2.01	40	d	//
	10.9	76	4.0	1.222	0.66	0.80	16	d	//
RC04	12.8	76	1.0	1.222	0.16	0.20	4	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	4	4
Minimum	0.20	4
Average	1.15	23
Maximum	2.01	40
Standard Dev.	0.81	16
Upper 95% Confidence Limit	2.74	54.82
Lower 95% Confidence Limit	-0.43	-8.64

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Appendix VI Laboratory Data

b. Chemical and Environmental

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

mCERTS

Final Report

Report No.:	20-10240-1
Initial Date of Issue:	22-Apr-2020
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	22455 Avid Development Sandyford (Aecom / Marlet)

Quotation No.:		**Date Received:**	08-Apr-2020
Order No.:		**Date Instructed:**	14-Apr-2020
No. of Samples:	21		
Turnaround (Wkdays):	7	**Results Due:**	22-Apr-2020
Date Approved:	22-Apr-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL						Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:						Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	996083	996084	996085	996086
Order No.:						Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850	136807	136811	136814	136819
						Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	TP7	TP8	TP9	TP10
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50	1.00	1.00	0.50	1.00
						Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50	1.00	1.00	0.50	1.00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**														
pH	U	1010	10:1		N/A		8.5	8.3	8.7	8.4	8.8	8.9	10.2	8.5	10.6	9.3	9.3	10.4	9.4
Ammonium	U	1220	10:1	mg/l	0.050		0.058	0.14	0.21	1.7	< 0.050	0.18	< 0.050	0.16	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10		0.69	1.6	2.7	19	0.48	2.5	0.64	1.9	0.63	0.85	0.30	0.52	0.25
Boron (Dissolved)	U	1450	10:1	µg/l	20		27	26	29	32	< 20	29	< 20	< 20	23	< 20	< 20	20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		0.27	0.26	0.29	0.32	< 0.20	0.29	< 0.20	< 0.20	0.23	< 0.20	< 0.20	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL						Chemtest Job No.:	20-10240	20-10240	20-10240
Quotation No.:						Chemtest Sample ID.:	996087	996088	996089
Order No.:						Client Sample Ref.:	138822	136827	13559
						Sample Location:	TP11	TP12	BH1
						Sample Type:	SOIL	SOIL	SOIL
						Top Depth (m):	0.50	1.00	1.00
						Bottom Depth (m):	0.50	1.00	1.00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**				
pH	U	1010	10:1		N/A		9.4	9.2	9.1
Ammonium	U	1220	10:1	mg/l	0.050		< 0.050	< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10		0.29	0.51	0.42
Boron (Dissolved)	U	1450	10:1	µg/l	20		< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		< 0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:			Client Sample Ref.:		131830	131831	131834	131838	131839	131842	131846	131847	131850
			Sample Location:		TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
			Bottom Depth (m):		0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	15	16	12	13	8.6	8.2	5.9	17	7.3
pH (2.5:1)	N	2010		4.0									
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.68	0.49	< 0.40	0.48	< 0.40	< 0.40	< 0.40	0.42	0.53
Magnesium (Water Soluble)	N	2120	g/l	0.010									
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									
Total Sulphur	M	2175	%	0.010									
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] 3.7	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Chloride (Water Soluble)	M	2220	g/l	0.010									
Nitrate (Water Soluble)	N	2220	g/l	0.010									
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 3.2	[A] 2.2	[A] 8.1	[A] 9.2	[A] 5.2	[A] 6.5	[A] 7.1	[A] 2.1	[A] 7.2
Ammonium (Water Soluble)	M	2120	g/l	0.01									
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.074	[A] 0.015	[A] 0.029	[A] 0.054	[A] 0.031	[A] 0.038	[A] 0.45	[A] 0.045	[A] 0.11
Arsenic	M	2450	mg/kg	1.0	18	14	21	20	24	22	18	14	20
Barium	M	2450	mg/kg	10	120	98	71	91	46	47	49	68	61
Cadmium	M	2450	mg/kg	0.10	2.1	1.1	2.4	2.9	1.6	2.1	0.67	2.6	1.2
Chromium	M	2450	mg/kg	1.0	21	26	16	18	13	12	15	20	20
Molybdenum	M	2450	mg/kg	2.0	2.8	2.8	3.5	3.4	2.9	3.7	< 2.0	3.9	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	2.0	2.1	< 2.0	< 2.0	< 2.0	2.2	< 2.0
Copper	M	2450	mg/kg	0.50	27	21	26	32	20	22	15	29	19
Mercury	M	2450	mg/kg	0.10	0.17	0.15	< 0.10	0.16	< 0.10	< 0.10	< 0.10	0.11	< 0.10
Nickel	M	2450	mg/kg	0.50	41	39	48	53	37	41	22	56	32
Lead	M	2450	mg/kg	0.50	59	34	31	84	19	21	12	28	17
Selenium	M	2450	mg/kg	0.20	0.83	0.50	0.35	0.54	< 0.20	0.29	< 0.20	0.63	< 0.20
Zinc	M	2450	mg/kg	0.50	93	140	86	99	59	67	52	110	68
Chromium (Trivalent)	N	2490	mg/kg	1.0	21	26	16	18	13	12	15	20	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	[A] 1.6	[A] 0.50	[A] 0.52	[A] 0.98	[A] 0.35	[A] 0.35	[A] 0.31	[A] 0.61	[A] < 0.20
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	150	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:					Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850
					Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[j]fluoranthene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082
Order No.:					Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850
					Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 52	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 118	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 153	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 138	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 180	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL					Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:					Chemtest Sample ID.:	996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:					Client Sample Ref.:	136807	136811	136814	136819	138822	136827	13559	135560	1
					Sample Location:	TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
					Bottom Depth (m):	1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-	-	-	-	-	-	-		
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
ACM Detection Stage	U	2192		N/A		-	-	-	-	-	-	-		
Moisture	N	2030	%	0.020		11	9.1	8.5	10	9.1	10	10	12	12
pH (2.5:1)	N	2010		4.0									[A] 8.6	[A] 8.7
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40		
Magnesium (Water Soluble)	N	2120	g/l	0.010									< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010									< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010									[A] 0.033	[A] 0.036
Sulphur (Elemental)	M	2180	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Chloride (Water Soluble)	M	2220	g/l	0.010									[A] < 0.010	[A] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010									< 0.010	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50		[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50		
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		[A] 6.6	[A] 7.8	[A] 9.3	[A] 8.3	[A] 8.3	[A] 7.6	[A] 6.6		
Ammonium (Water Soluble)	M	2120	g/l	0.01									0.02	0.04
Sulphate (Acid Soluble)	M	2430	%	0.010		[A] 0.011	[A] 0.013	[A] 0.083	[A] 0.012	[A] 0.033	[A] 0.010	[A] 0.017	[A] 0.018	[A] < 0.010
Arsenic	M	2450	mg/kg	1.0		23	22	23	23	24	21	23		
Barium	M	2450	mg/kg	10		71	63	65	100	50	62	71		
Cadmium	M	2450	mg/kg	0.10		2.3	1.9	1.2	2.0	1.8	2.0	2.0		
Chromium	M	2450	mg/kg	1.0		15	13	15	15	14	14	14		
Molybdenum	M	2450	mg/kg	2.0		3.4	3.4	2.5	3.7	3.4	3.6	3.5		
Antimony	N	2450	mg/kg	2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		
Copper	M	2450	mg/kg	0.50		26	22	19	26	23	26	25		
Mercury	M	2450	mg/kg	0.10		< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10		
Nickel	M	2450	mg/kg	0.50		51	41	32	47	42	46	46		
Lead	M	2450	mg/kg	0.50		21	18	20	19	23	18	19		
Selenium	M	2450	mg/kg	0.20		< 0.20	0.41	0.30	1.4	0.24	1.6	0.37		
Zinc	M	2450	mg/kg	0.50		79	76	64	76	67	75	74		
Chromium (Trivalent)	N	2490	mg/kg	1.0		15	13	15	15	14	14	14		
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Total Organic Carbon	M	2625	%	0.20		[A] 0.28	[A] 0.35	[A] 0.56	[A] 0.38	[A] 0.31	[A] 0.34	[A] 0.34		
Mineral Oil	N	2670	mg/kg	10		< 10	< 10	< 10	< 10	< 10	< 10	< 10		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:			Client Sample Ref.:		136807	136811	136814	136819	138822	136827	13559	135560	1
			Sample Location:		TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Bottom Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10		
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.31	< 0.10	< 0.10	< 0.10	< 0.10		
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10		
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.7	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[j]fluoranthene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10	< 0.10	< 0.10		
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	< 0.10		
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.5	< 0.10	< 0.10	< 0.10	< 0.10		
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	1.5	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.51	< 0.10	< 0.10	< 0.10	< 0.10		
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.53	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.56	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996083	996084	996085	996086	996087	996088	996089	996090	996091
Order No.:			Client Sample Ref.:		136807	136811	136814	136819	138822	136827	13559	135560	1
			Sample Location:		TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH2
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Bottom Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	2.00	1.00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.37	< 0.10	< 0.10	< 0.10	< 0.10		
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	8.7	< 2.0	< 2.0	< 2.0	< 2.0		
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10		
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30		

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A			
Asbestos Identification	U	2192	%	0.001			
ACM Detection Stage	U	2192		N/A			
Moisture	N	2030	%	0.020	18	12	10
pH (2.5:1)	N	2010		4.0	[A] 8.4	[A] 8.5	[A] 8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010	[A] 0.055	[A] 0.11	[A] 0.044
Sulphur (Elemental)	M	2180	mg/kg	1.0			
Chloride (Water Soluble)	M	2220	g/l	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50			
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50			
Ammonium (Water Soluble)	M	2120	g/l	0.01	2.8	0.07	0.03
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.027	[A] < 0.010	[A] 0.022
Arsenic	M	2450	mg/kg	1.0			
Barium	M	2450	mg/kg	10			
Cadmium	M	2450	mg/kg	0.10			
Chromium	M	2450	mg/kg	1.0			
Molybdenum	M	2450	mg/kg	2.0			
Antimony	N	2450	mg/kg	2.0			
Copper	M	2450	mg/kg	0.50			
Mercury	M	2450	mg/kg	0.10			
Nickel	M	2450	mg/kg	0.50			
Lead	M	2450	mg/kg	0.50			
Selenium	M	2450	mg/kg	0.20			
Zinc	M	2450	mg/kg	0.50			
Chromium (Trivalent)	N	2490	mg/kg	1.0			
Chromium (Hexavalent)	N	2490	mg/kg	0.50			
Total Organic Carbon	M	2625	%	0.20			
Mineral Oil	N	2670	mg/kg	10			
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			

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Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			
Benzene	M	2760	µg/kg	1.0			
Toluene	M	2760	µg/kg	1.0			
Ethylbenzene	M	2760	µg/kg	1.0			
m & p-Xylene	M	2760	µg/kg	1.0			
o-Xylene	M	2760	µg/kg	1.0			
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			
Naphthalene	M	2800	mg/kg	0.10			
Acenaphthylene	N	2800	mg/kg	0.10			
Acenaphthene	M	2800	mg/kg	0.10			
Fluorene	M	2800	mg/kg	0.10			
Phenanthrene	M	2800	mg/kg	0.10			
Benzo[j]fluoranthene	N	2800	mg/kg	0.10			
Anthracene	M	2800	mg/kg	0.10			
Fluoranthene	M	2800	mg/kg	0.10			
Pyrene	M	2800	mg/kg	0.10			
Benzo[a]anthracene	M	2800	mg/kg	0.10			
Chrysene	M	2800	mg/kg	0.10			
Benzo[b]fluoranthene	M	2800	mg/kg	0.10			
Benzo[k]fluoranthene	M	2800	mg/kg	0.10			
Benzo[a]pyrene	M	2800	mg/kg	0.10			
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10			
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10			

Results - Soil

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Client: IGSL			Chemtest Job No.:		20-10240	20-10240	20-10240
Quotation No.:			Chemtest Sample ID.:		996092	996093	996094
Order No.:			Client Sample Ref.:		13551	13553	130581
			Sample Location:		BH3	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		1.00	3.00	1.00
			Bottom Depth (m):		1.00	3.00	1.00
			Asbestos Lab:				
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10			
Coronene	N	2800	mg/kg	0.10			
Total Of 17 PAH's	N	2800	mg/kg	2.0			
PCB 28	U	2815	mg/kg	0.010			
PCB 52	U	2815	mg/kg	0.010			
PCB 90+101	U	2815	mg/kg	0.010			
PCB 118	U	2815	mg/kg	0.010			
PCB 153	U	2815	mg/kg	0.010			
PCB 138	U	2815	mg/kg	0.010			
PCB 180	U	2815	mg/kg	0.010			
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10			
Total Phenols	M	2920	mg/kg	0.30			

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240						
Chemtest Sample ID:	996074						
Sample Ref:	131830						
Sample ID:							
Sample Location:	TP1						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Landfill Waste Acceptance Criteria Limits**		
					Inert Waste Landfill	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 1.6	3	5	6
Loss On Ignition	2610	M	%	5.5	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0093	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0011	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0033	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.47	4.7	10	150	500
Sulphate	1220	U	16	160	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.5	95	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	15

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996075						
Sample Ref:	131831						
Sample ID:							
Sample Location:	TP1						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.50	3	5	6
Loss On Ignition	2610	M	%	3.7	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.028	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0030	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	3.2	32	1000	20000	50000
Total Dissolved Solids	1020	N	62	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.9	59	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	16

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996076						
Sample Ref:	131834						
Sample ID:							
Sample Location:	TP2						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.52	3	5	6
Loss On Ignition	2610	M	%	3.1	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0065	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0014	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0076	0.076	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	19	190	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996077						
Sample Ref:	131838						
Sample ID:							
Sample Location:	TP3						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.98	3	5	6
Loss On Ignition	2610	M	%	4.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.083	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0015	< 0.050	0.5	2	25
Barium	1450	U	0.023	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0031	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0047	< 0.050	0.5	10	30
Nickel	1450	U	0.0018	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	0.0015	0.015	0.06	0.7	5
Selenium	1450	U	0.0011	0.011	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	5.7	57	1000	20000	50000
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	14	140	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996078						
Sample Ref:	131839						
Sample ID:							
Sample Location:	TP3						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0015	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0052	0.052	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	2.2	22	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.0	80	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.6

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996079						
Sample Ref:	131842						
Sample ID:							
Sample Location:	TP4						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0020	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0074	0.074	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	7.1	71	1000	20000	50000
Total Dissolved Solids	1020	N	57	570	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.6	56	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.2

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996080						
Sample Ref:	131846						
Sample ID:							
Sample Location:	TP5						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.31	3	5	6
Loss On Ignition	2610	M	%	1.7	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		10.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0011	< 0.050	0.5	2	25
Barium	1450	U	0.023	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0041	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00069	0.0069	0.01	0.2	2
Molybdenum	1450	U	0.0034	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0010	0.010	0.1	0.5	7
Zinc	1450	U	0.011	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	310	3100	1000	20000	50000
Total Dissolved Solids	1020	N	400	4000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	5.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996081						
Sample Ref:	131847						
Sample ID:							
Sample Location:	TP5						
Top Depth(m):	1.20						
Bottom Depth(m):	1.20						
Sampling Date:					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	M	%	[A] 0.61	3	5	6
Loss On Ignition	2610	M	%	3.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.037	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0061	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0041	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	16	160	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.3	63	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996082						
Sample Ref:	131850						
Sample ID:							
Sample Location:	TP6						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] < 0.20	3	5	6
Loss On Ignition	2610	M	%	2.0	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		10.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0029	< 0.050	0.5	2	25
Barium	1450	U	0.0040	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0040	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0031	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	23	230	1000	20000	50000
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.3

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996083						
Sample Ref:	136807						
Sample ID:							
Sample Location:	TP7						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.28	3	5	6
Loss On Ignition	2610	M	%	2.5	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.19	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0072	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.14	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.29	2.9	10	150	500
Sulphate	1220	U	2.0	20	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996084						
Sample Ref:	136811						
Sample ID:							
Sample Location:	TP8						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.35	3	5	6
Loss On Ignition	2610	M	%	2.2	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0014	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0089	0.089	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.7	57	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996085						
Sample Ref:	136814						
Sample ID:							
Sample Location:	TP9						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.56	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	8.7	100	--	--
pH	2010	M		9.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0017	< 0.050	0.5	2	25
Barium	1450	U	0.0043	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0018	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.015	0.15	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0011	0.011	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	42	420	1000	20000	50000
Total Dissolved Solids	1020	N	120	1200	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.5

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996086						
Sample Ref:	136819						
Sample ID:							
Sample Location:	TP10						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.38	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.13	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0019	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0071	0.071	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	2.1	21	1000	20000	50000
Total Dissolved Solids	1020	N	53	<530	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.2	52	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240							
Chemtest Sample ID:	996087							
Sample Ref:	138822							
Sample ID:								
Sample Location:	TP11							
Top Depth(m):	0.50							
Bottom Depth(m):	0.50							
Sampling Date:								
						Landfill Waste Acceptance Criteria Limits		
Determinand	SOP	Accred.	Units			Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%		[A] 0.31	3	5	6
Loss On Ignition	2610	M	%		2.3	--	--	10
Total BTEX	2760	M	mg/kg		[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg		< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg		[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg		< 2.0	100	--	--
pH	2010	M			8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg		0.14	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l		10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0013		< 0.050	0.5	2	25
Barium	1450	U	0.0020		< 0.50	20	100	300
Cadmium	1450	U	< 0.00010		< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010		< 0.050	0.5	10	70
Copper	1450	U	< 0.0010		< 0.050	2	50	100
Mercury	1450	U	0.00052		0.0052	0.01	0.2	2
Molybdenum	1450	U	0.0072		0.072	0.5	10	30
Nickel	1450	U	< 0.0010		< 0.050	0.4	10	40
Lead	1450	U	< 0.0010		< 0.010	0.5	10	50
Antimony	1450	U	0.0021		0.021	0.06	0.7	5
Selenium	1450	U	< 0.0010		< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010		< 0.50	4	50	200
Chloride	1220	U	< 1.0		< 10	800	15000	25000
Fluoride	1220	U	0.19		1.9	10	150	500
Sulphate	1220	U	8.3		83	1000	20000	50000
Total Dissolved Solids	1020	N	49		490	4000	60000	100000
Phenol Index	1920	U	< 0.030		< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.7		77	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

Chemtest Job No:	20-10240				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	996088						
Sample Ref:	136827						
Sample ID:							
Sample Location:	TP12						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.34	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.15	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00050	0.0050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.14	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	1.8	18	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.3	73	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Results - Single Stage WAC

Project: 22455 Avid Development Sandyford (Aecom / Marlet)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-10240						
Chemtest Sample ID:	996089						
Sample Ref:	13559						
Sample ID:							
Sample Location:	BH1						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.34	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0031	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.00062	0.0062	0.01	0.2	2
Molybdenum	1450	U	0.012	0.12	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	2.1	21	1000	20000	50000
Total Dissolved Solids	1020	N	52	520	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.3	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996074	131830		TP1		A	Amber Glass 250ml
996074	131830		TP1		A	Plastic Tub 500g
996075	131831		TP1		A	Amber Glass 250ml
996075	131831		TP1		A	Plastic Tub 500g
996076	131834		TP2		A	Amber Glass 250ml
996076	131834		TP2		A	Plastic Tub 500g
996077	131838		TP3		A	Amber Glass 250ml
996077	131838		TP3		A	Plastic Tub 500g
996078	131839		TP3		A	Amber Glass 250ml
996078	131839		TP3		A	Plastic Tub 500g
996079	131842		TP4		A	Amber Glass 250ml
996079	131842		TP4		A	Plastic Tub 500g
996080	131846		TP5		A	Amber Glass 250ml
996080	131846		TP5		A	Plastic Tub 500g
996081	131847		TP5		A	Amber Glass 250ml
996081	131847		TP5		A	Plastic Tub 500g
996082	131850		TP6		A	Amber Glass 250ml
996082	131850		TP6		A	Plastic Tub 500g
996083	136807		TP7		A	Amber Glass 250ml
996083	136807		TP7		A	Plastic Tub 500g
996084	136811		TP8		A	Amber Glass 250ml
996084	136811		TP8		A	Plastic Tub 500g

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Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996085	136814		TP9		A	Amber Glass 250ml
996085	136814		TP9		A	Plastic Tub 500g
996086	136819		TP10		A	Amber Glass 250ml
996086	136819		TP10		A	Plastic Tub 500g
996087	138822		TP11		A	Amber Glass 250ml
996087	138822		TP11		A	Plastic Tub 500g
996088	136827		TP12		A	Amber Glass 250ml
996088	136827		TP12		A	Plastic Tub 500g
996089	13559		BH1		A	Amber Glass 250ml
996089	13559		BH1		A	Plastic Tub 500g
996090	135560		BH1		A	Amber Glass 250ml
996090	135560		BH1		A	Plastic Tub 500g
996091	1		BH2		A	Amber Glass 250ml
996091	1		BH2		A	Plastic Tub 500g
996092	13551		BH3		A	Amber Glass 250ml
996092	13551		BH3		A	Plastic Tub 500g
996093	13553		BH3		A	Amber Glass 250ml
996093	13553		BH3		A	Plastic Tub 500g
996094	130581		BH4		A	Amber Glass 250ml
996094	130581		BH4		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID

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Test Methods

SOP	Title	Parameters included	Method summary
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix VI Test Data

c. Water Levels and Gas Concentrations

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.
Project No.	22455
Client	Market
Date	20th March 2020

	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.5	2.9	2.2	2.4				
GAS FLOW	n/a	n/a	n/a	n/a				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.1	0.0	0.2	0.0				
O2(%)	20.7	19.9	19.6	20.6				
BAROMETRIC PRESURE (mb)	1014	1014	1014	1014				
WEATHER	Sunny	Sunny	Sunny	Sunny				
COMMENTS								

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.							
Project No.	22455							
Client	Marlet							
Date	15th May 2020							
	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.2	2.6	1.9	2.05				
GAS FLOW	n/a	n/a	n/a	n/a				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.1	0.0	0.1	0.0				
O2(%)	20.5	19.7	19.9	20.1				
BAROMETRIC PRESURE (mb)	1006	1006	1006	1006				
WEATHER	Sunny	Sunny	Sunny	Sunny				
COMMENTS								

Gas & Groundwater Monitoring

Site Location	Carmanhall road, Sandyford.							
Project No.	22455							
Client	Marlet							
Date	16-Jun-20							
	BH3	RC2	BH1	RC4				
WATER LEVEL (m bgl)	2.1	2.5	1.63	1.63				
GAS FLOW	0.0l/hr	0l/hr	0l/hr	0l/hr				
CH4(%)	0.0	0.0	0.0	0.0				
LEL(%)	0.0	0.0	0.0	0.0				
CO2(%)	0.0	0.0	0.1	0.0				
O2(%)	20.7	19.9	20.4	20.6				
BAROMETRIC PRESURE (mb)	1001	1001	1001	1001				
WEATHER	Raining	Raining	Raining	Raining				
COMMENTS								

Appendix VII Site Plan

LEGEND

- TP (12No.)
- BH (4No.)
- IT (2No.)
- CBR (1No.)

NOTE:
DRAWING TO BE READ IN CONJUNCTION WITH GROUND INVESTIGATION SCOPE OF WORKS

Borehole Schedule

Ref	Position X	Position Y
BH-01	[illegible]	[illegible]
BH-02	[illegible]	[illegible]
BH-03	[illegible]	[illegible]
BH-04	[illegible]	[illegible]

Trial Pit Schedule

Ref	Position X	Position Y
TP-01	[illegible]	[illegible]
TP-02	[illegible]	[illegible]
TP-03	[illegible]	[illegible]
TP-04	[illegible]	[illegible]
TP-05	[illegible]	[illegible]
TP-06	[illegible]	[illegible]
TP-07	[illegible]	[illegible]
TP-08	[illegible]	[illegible]
TP-09	[illegible]	[illegible]
TP-10	[illegible]	[illegible]
TP-11	[illegible]	[illegible]
TP-12	[illegible]	[illegible]

Infiltration Schedule

Ref	Position X	Position Y
IT-01	[illegible]	[illegible]
IT-02	[illegible]	[illegible]

CBR Schedule

Ref	Position X	Position Y
CBR-01	[illegible]	[illegible]

AECOM

PROJECT
Residental Development at Sandyford Avid Site

CLIENT
Marlet Property Group

CONSULTANT
AECOM
4th Floor, Adelphi Plaza, George's Street Upper, Dun Laoghaire, Co Dublin
+353 (0)1 2383100 tel
+353 (0)1 238 3199 fax
www.aecom.com

NOTES

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	18.02.2020	Issued for Tender

SUITABILITY STATUS
D2 - Suitable for Tender

PROJECT NUMBER
PR-461030

SHEET TITLE
Site Investigation Scope of Works

SHEET NUMBER
AVID-ACM-00-XX-DR-S-060001

SCALE: 1:500 REV: P01

D. Greenfield Run-off Rate Calculations for Proposed Site

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Laura Ruiz
Site name:	TACK SHD
Site location:	Sandyford

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	
Longitude:	
Reference:	916828047
Date:	Mar 31 2022 16:58

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.46

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	0	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.00	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	0	930
Hydrological region:	1	1
Growth curve factor 1 year:	-	0.85
Growth curve factor 30 years:	-	1.95
Growth curve factor 100 years:	-	2.48
Growth curve factor 200 years:	-	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0	1.84
1 in 1 year (l/s):		1.57
1 in 30 years (l/s):		3.59
1 in 100 year (l/s):		4.57
1 in 200 years (l/s):		5.23

E. Attenuation Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.800	Minimum Backdrop Height (m)	0.200
Ratio-R	0.274	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
3	0.025	4.00	85.470	1200	719353.583	726533.352	1.425
20			84.350	1200	719376.314	726575.258	1.600
19	0.025	4.00	84.430	1200	719370.802	726565.006	1.425
17	0.140	4.00	84.150	1200	719347.616	726586.027	1.630
16	0.056	4.00	84.150	1200	719354.578	726598.631	1.780
15			84.150	1200	719372.569	726584.828	2.370
14			84.250	1200	719379.482	726581.589	2.509
13			83.950	1200	719398.596	726617.105	2.478
5	0.072	4.00	84.870	1200	719376.194	726602.582	1.425
6			84.200	1200	719382.001	726577.750	1.419
7	0.059	4.00	83.990	1200	719398.173	726610.716	1.025
8	0.082	4.00	84.150	1200	719370.962	726590.817	2.130
9			84.150	1200	719369.445	726586.155	2.350
2			83.950	1200	719405.157	726615.358	2.523
1			84.250	1200	719420.522	726621.550	2.934

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2	2	1	16.673	0.600	81.427	81.316	0.111	150.0	225	6.19	1.0
13	13	2	6.791	0.600	81.472	81.427	0.045	150.0	225	5.93	1.0
14	14	13	40.334	0.600	81.741	81.472	0.269	150.0	225	5.82	1.0
15	15	14	7.704	0.600	81.780	81.741	0.039	200.0	225	5.19	1.0
16	16	8	18.260	0.600	82.370	82.020	0.350	52.2	225	4.35	50.0
17	17	16	14.469	0.600	82.520	82.370	0.150	96.5	225	4.18	50.0
5	5	8	12.876	0.600	83.445	83.228	0.217	59.3	225	4.13	50.0
3	3	19	36.034	0.600	84.045	83.005	1.040	34.6	225	4.27	50.0
8	8	9	4.903	0.600	82.020	81.800	0.220	22.3	225	4.38	50.0
9	9	15	3.394	0.600	81.800	81.780	0.020	169.7	225	5.05	1.0
19	19	20	11.640	0.600	83.005	82.750	0.255	45.6	225	4.37	50.0
7	7	6	36.719	0.600	82.965	82.781	0.184	200.0	225	4.66	50.0
6	6	20	6.209	0.600	82.781	82.750	0.031	200.0	225	4.78	50.0
20	20	9	12.881	0.600	82.750	82.674	0.076	169.5	225	4.99	50.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.800	Drain Down Time (mins)	240
Ratio-R	0.274	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	30	0	0

Node 14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.741	Product Number	CTL-SHE-0054-1800-2000-1800
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.8	Min Node Diameter (mm)	1200

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	81.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	210.0	0.0	2.000	210.0	0.0	2.001	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 15 minute summer	208.939	59.123
30 year 15 minute winter	146.624	59.123
30 year 30 minute summer	144.850	40.988
30 year 30 minute winter	101.649	40.988
30 year 60 minute summer	103.437	27.335
30 year 60 minute winter	68.721	27.335
30 year 120 minute summer	67.025	17.713
30 year 120 minute winter	44.530	17.713
30 year 180 minute summer	52.724	13.568
30 year 180 minute winter	34.272	13.568
30 year 240 minute summer	42.216	11.156
30 year 240 minute winter	28.047	11.156
30 year 360 minute summer	32.862	8.456
30 year 360 minute winter	21.361	8.456
30 year 480 minute summer	26.256	6.939
30 year 480 minute winter	17.444	6.939
30 year 600 minute summer	21.742	5.947

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 600 minute winter	14.855	5.947
30 year 720 minute summer	19.551	5.240
30 year 720 minute winter	13.140	5.240
30 year 960 minute summer	16.282	4.287
30 year 960 minute winter	10.786	4.287
30 year 1440 minute summer	12.035	3.226
30 year 1440 minute winter	8.088	3.226
30 year 2160 minute summer	8.762	2.422
30 year 2160 minute winter	6.037	2.422
30 year 2880 minute summer	7.363	1.973
30 year 2880 minute winter	4.948	1.973
30 year 4320 minute summer	5.653	1.478
30 year 4320 minute winter	3.723	1.478
30 year 5760 minute summer	4.707	1.205
30 year 5760 minute winter	3.047	1.205
30 year 7200 minute summer	4.032	1.029
30 year 7200 minute winter	2.603	1.029
30 year 8640 minute summer	3.544	0.904
30 year 8640 minute winter	2.288	0.904
30 year 10080 minute summer	3.179	0.811
30 year 10080 minute winter	2.052	0.811
100 year +30% CC 15 minute summer	349.324	98.847
100 year +30% CC 15 minute winter	245.140	98.847
100 year +30% CC 30 minute summer	245.025	69.334
100 year +30% CC 30 minute winter	171.948	69.334
100 year +30% CC 60 minute summer	176.443	46.629
100 year +30% CC 60 minute winter	117.224	46.629
100 year +30% CC 120 minute summer	114.583	30.281
100 year +30% CC 120 minute winter	76.126	30.281
100 year +30% CC 180 minute summer	89.817	23.113
100 year +30% CC 180 minute winter	58.383	23.113
100 year +30% CC 240 minute summer	71.506	18.897
100 year +30% CC 240 minute winter	47.507	18.897
100 year +30% CC 360 minute summer	55.219	14.210
100 year +30% CC 360 minute winter	35.894	14.210
100 year +30% CC 480 minute summer	43.859	11.591
100 year +30% CC 480 minute winter	29.139	11.591
100 year +30% CC 600 minute summer	36.139	9.885
100 year +30% CC 600 minute winter	24.692	9.885
100 year +30% CC 720 minute summer	32.360	8.673
100 year +30% CC 720 minute winter	21.748	8.673
100 year +30% CC 960 minute summer	26.757	7.046
100 year +30% CC 960 minute winter	17.724	7.046
100 year +30% CC 1440 minute summer	19.562	5.243
100 year +30% CC 1440 minute winter	13.147	5.243
100 year +30% CC 2160 minute summer	14.070	3.888
100 year +30% CC 2160 minute winter	9.695	3.888
100 year +30% CC 2880 minute summer	11.714	3.139
100 year +30% CC 2880 minute winter	7.872	3.139
100 year +30% CC 4320 minute summer	8.874	2.320
100 year +30% CC 4320 minute winter	5.844	2.320
100 year +30% CC 5760 minute summer	7.323	1.875

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +30% CC 5760 minute winter	4.740	1.875
100 year +30% CC 7200 minute summer	6.230	1.589
100 year +30% CC 7200 minute winter	4.021	1.589
100 year +30% CC 8640 minute summer	5.447	1.390
100 year +30% CC 8640 minute winter	3.515	1.390
100 year +30% CC 10080 minute summer	4.864	1.241
100 year +30% CC 10080 minute winter	3.139	1.241

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	3	10	84.088	0.043	7.1	0.0636	0.0000	OK
15 minute winter	20	10	82.908	0.158	30.2	0.1781	0.0000	OK
15 minute winter	19	10	83.070	0.065	14.2	0.0963	0.0000	OK
1440 minute winter	17	1380	82.747	0.227	2.6	0.6467	0.0000	SURCHARGED
1440 minute winter	16	1380	82.747	0.377	3.7	0.6635	0.0000	SURCHARGED
1440 minute winter	15	1380	82.747	0.967	1.4	1.0938	0.0000	SURCHARGED
1440 minute winter	14	1380	82.747	1.006	1.4	1.1374	0.0000	SURCHARGED
1440 minute winter	13	1380	81.500	0.028	1.3	0.0318	0.0000	OK
15 minute summer	5	10	83.536	0.091	20.5	0.1947	0.0000	OK
15 minute winter	6	10	82.921	0.140	16.8	0.1585	0.0000	OK
15 minute summer	7	10	83.071	0.106	16.8	0.2420	0.0000	OK
1440 minute winter	8	1380	82.747	0.727	6.6	1.3819	0.0000	SURCHARGED
1440 minute winter	9	1380	82.747	0.947	13.7	199.9246	0.0000	SURCHARGED
1440 minute winter	2	1380	81.455	0.028	1.3	0.0312	0.0000	OK
1440 minute winter	1	1380	81.343	0.027	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	3	3	19	7.1	0.973	0.080	0.2657	
15 minute winter	20	20	9	29.7	1.056	0.747	0.3625	
15 minute winter	19	19	20	14.2	0.802	0.184	0.2280	
1440 minute winter	17	17	16	2.6	0.678	0.049	0.5754	
1440 minute winter	16	16	8	3.7	0.836	0.051	0.7262	
1440 minute winter	15	15	14	1.4	0.168	0.039	0.3064	
1440 minute winter	14	Hydro-Brake®	13	1.3				
1440 minute winter	13	13	2	1.3	0.471	0.031	0.0191	
15 minute summer	5	5	8	20.5	1.433	0.303	0.1842	
15 minute winter	6	6	20	16.0	0.576	0.437	0.1728	
15 minute summer	7	7	6	16.9	0.800	0.461	0.8108	
1440 minute winter	8	8	9	12.0	1.200	0.109	0.1950	
1440 minute winter	9	9	15	1.4	0.348	0.036	0.1350	
1440 minute winter	2	2	1	1.3	0.483	0.031	0.0457	112.3

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	3	10	84.100	0.055	11.9	0.0822	0.0000	OK
2160 minute winter	20	2040	83.479	0.729	2.5	0.8250	0.0000	SURCHARGED
2160 minute winter	19	2040	83.479	0.474	1.2	0.7031	0.0000	SURCHARGED
15 minute winter	17	11	83.643	1.123	66.6	3.2005	0.0000	SURCHARGED
2160 minute winter	16	2040	83.480	1.110	4.4	1.9527	0.0000	SURCHARGED
2160 minute winter	15	2040	83.480	1.700	1.6	1.9225	0.0000	SURCHARGED
2160 minute winter	14	2040	83.479	1.738	1.8	1.9657	0.0000	SURCHARGED
2160 minute winter	13	2040	81.504	0.032	1.7	0.0359	0.0000	OK
15 minute winter	5	10	83.569	0.124	34.3	0.2664	0.0000	OK
2160 minute winter	6	2040	83.479	0.698	1.3	0.7899	0.0000	SURCHARGED
2160 minute winter	7	2040	83.479	0.514	1.3	1.1739	0.0000	SURCHARGED
2160 minute winter	8	2040	83.479	1.459	7.8	2.7745	0.0000	SURCHARGED
2160 minute winter	9	2040	83.479	1.679	10.1	354.5759	0.0000	SURCHARGED
2160 minute winter	2	2040	81.458	0.031	1.7	0.0352	0.0000	OK
2160 minute winter	1	2040	81.347	0.031	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	3	3	19	11.9	1.124	0.134	0.3848	
2160 minute winter	20	20	9	2.5	0.555	0.063	0.5123	
2160 minute winter	19	19	20	1.2	0.396	0.016	0.4629	
15 minute winter	17	17	16	59.0	1.483	1.114	0.5754	
2160 minute winter	16	16	8	4.3	0.744	0.060	0.7262	
2160 minute winter	15	15	14	1.8	0.155	0.049	0.3064	
2160 minute winter	14	Hydro-Brake®	13	1.7				
2160 minute winter	13	13	2	1.7	0.505	0.040	0.0228	
15 minute winter	5	5	8	34.3	1.619	0.507	0.2728	
2160 minute winter	6	6	20	1.3	0.358	0.036	0.2469	
2160 minute winter	7	7	6	1.3	0.437	0.036	1.4604	
2160 minute winter	8	8	9	7.7	0.908	0.070	0.1950	
2160 minute winter	9	9	15	1.6	0.277	0.040	0.1350	
2160 minute winter	2	2	1	1.7	0.520	0.040	0.0543	191.2

F. Irish Water Statement of Design Acceptance

Jairo Rivero
Block S
Eastpoint Business Park
Alfie Byrne Road
D03H3F4
Dublin
Ireland

Uisce Éireann
Bosca OP 448
Oifig Sheachadta Na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City

www.water.ie

28 March 2022

Re: Design Submission for Ravens Rock Road, Sandyford, Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS21008079

Dear Jairo Rivero,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

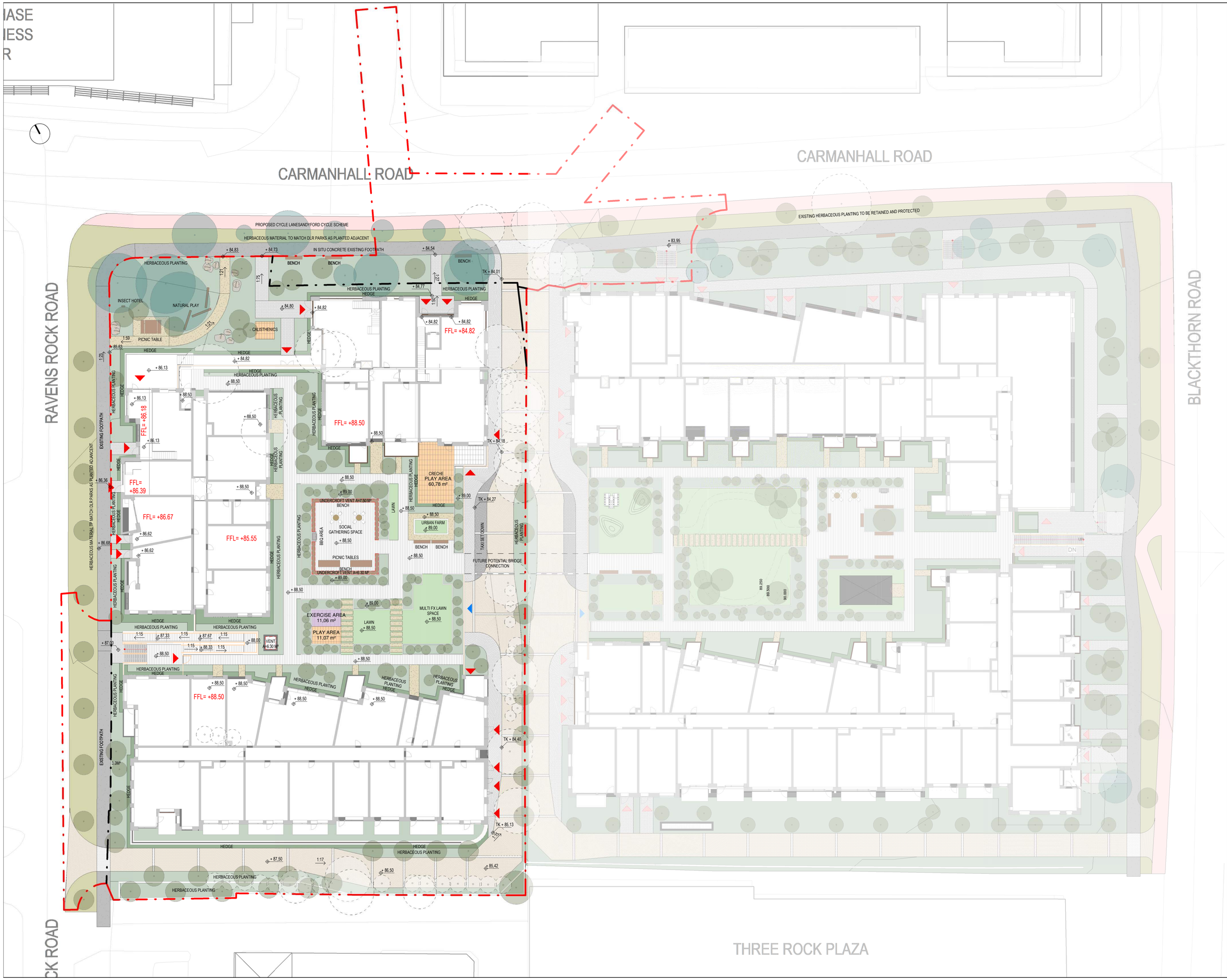
- [21-118-P150 - Proposed Water Supply Layout]
- [21-118-P122 - Proposed Foul Water Drainage Layout]
- [21-118 Foul long sections]

This Statement of Design Acceptance is valid for Phase 1 of the development, 207 units plus creche located on the western side of the site.

Irish Water notes that the water and wastewater infrastructure will remain private and not be vested.

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.



NOTE

ALL DIMENSIONS TO BE CHECKED ON SITE
NO DIMENSIONS TO BE SCALED FROM THIS DRAWING
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH RELEVANT CONSULTANTS DRAWINGS

FOR DRAWING INDEX, GENERAL NOTES, REFER TO DWG L1-001

CLIENT:

Sandyford Environmental Construction Limited

ARCHITECTS:

MDO ARCHITECTS

LEGEND

- HEDGE PLANTING
- HERBACEOUS PLANTING
- HERBACEOUS MATERIAL TP MATCH DLR PARKS AS PLANTED
- LAWN
- GATE TO COMMUNAL AND PRIVATE AMENITY SPACES
- SITE BOUNDARY
- LEGAL INTEREST BOUNDARY
- BUILDING ENTRACE
- CAR PARK ENTRACE
- 0.00 LEVEL
- P CAR PARKING
- TAXI SET DOWN
- PUBLIC REALM PAVING
- NATURAL STONE PAVING BAND
- SHARED SURFACE
- IN SITU CONCRETE EXISTING FOOTPATH
- RESIN BOUND GRAVEL
- COURTYARD PAVING
- SOFT POUR PLAYGROUND FINISH
- PROPOSED TREES
- EXISTING TREES TO BE RETAINED
- EXISTING TREES TO BE REMOVED

DRAFT

01	BOUNDARY LINE	15/03/2022

REVISIONS

Job No.	18A5A	Drawn By	NN
Dwg No.	T-L1-500	Checked By	JM
Scale	1 : 250 @A1	Date	MARCH 2022

JOB DESCRIPTION

Site	RAVENS ROCK ROAD
Project	TACK SANDYFORD SHD
Title	LANDSCAPE PLAN

NMP Niall Montgomery + Partners
Architects 33 Rock Road, Willamstown, Blackrock, Co. Dublin
Telephones : 2121 800 Fax : 2121 007 E mail : info@nmp.ie

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

LEGEND FOUL WATER

FW MH2
CL 84.000
IL 80.049
225mmØ @ 1:200.0 ←
INDICATES PROPOSED PUBLIC FOUL WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

F MH 1
CL 84.100
IL 83.100
ø225 → @ 1:43.2
INDICATES PROPOSED PRIVATE FOUL WATER SEWER, PIPE SIZE AND GRADIENT WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

FWDP
PROPOSED 150mmø FOUL WASTE WATER DOWN PIPE (BY OTHERS)

Ex. FW
CL: 83.79
IL: 81.90
EX 225ø
FOUL → FOUL
INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS

INDICATES FUTURE FOOTPATH

INDICATES FUTURE CYCLETRACK

INDICATES FUTURE ROAD

INDICATES FUTURE GRASS VERGE

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD AND ATLAS GP LTD.

ARCHITECT MC CAULEY DAYE O'CONNELL

PROJECT
TACK SANDYFORD LRD

TITLE
PROPOSED FOUL WATER DRAINAGE LAYOUT

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P122	

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

8 March 2022 15:06 - - DRAFT - - Laura Ruiz Garrido

Ex. FW
CL: 81.80
IL: 79.32

EX 225ø

Ex. FW
CL: 84.10
IL: 81.23

ø225 → @ 1:80.4

F MH 12
CL 84.300
IL 81.535

ø225 ← @ 1:55.5

F MH 11
CL 84.000
IL 81.848

EX 225ø

Ex. FW
CL: 83.79
IL: 81.90

Ex. FW
CL: 83.92
IL: 82.01

ø225 → @ 1:142.5

F MH 10
CL 83.980
IL 81.900

CARMANHALL ROAD

RAVENS ROCK ROAD

existing footpath

existing footpath

proposed footpath

existing footpath

existing footpath

FWDP

F MH 8
CL 84.100
IL 82.370

ø225 → @ 1:109.7

ø225 → @ 1:108.6

F MH 6
CL 84.100
IL 82.520

F MH 9
CL 84.175
IL 82.050

ø225 → @ 1:230.8

TAXI SET DOWN

TAXI SET DOWN

PEDESTRIAN LINK BRIDGE

STOP

STOP

F MH 3 S/O
CL 84.100
IL 82.750

F MH 4
CL 84.420
IL 82.166

RISING MAIN FROM BASEMENT

ø225 → @ 1:200.0

F MH 2
CL 85.200
IL 82.350

ø225 → @ 1:43.2

F MH 1
CL 84.100
IL 83.100

FFL 86.615

FFL 85.00

1:10 SLOPE

Mar 08, 2022 - 3:06pm Drawing Location: M:\Projects\21\21-118 - Ravens Rock\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\TACK PLANNING\21-118-P122 - Proposed Foul Water Drainage Layout.dwg

NOTES:

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NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTE:
RISING MAINS TO BE DEMARCATED IN ACCORDANCE WITH SECTION 3.5.22 OF WASTEWATER CODE OF PRACTICE.

LEGEND FOUL AND SURFACE WATER

- INDICATES PROPOSED PUBLIC FOUL WATER SEWER AND MANHOLE.
- INDICATES PROPOSED PRIVATE FOUL WATER SEWER AND MANHOLE
- Ex. FW CL: 83.79 IL: 81.90 — INDICATES EXISTING SURFACE WATER PUBLIC SEWER PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES PROPOSED SURFACE WATER SEWER AND MANHOLE
- Ex. SW CL: 84.25 IL: 81.00 — INDICATES EXISTING SURFACE WATER PUBLIC SEWER,PIPE SIZE WITH MANHOLE REFERENCE, COVER AND INVERT LEVELS
- INDICATES FUTURE FOOTPATH
- INDICATES FUTURE CYCLETRACK
- INDICATES FUTURE ROAD
- INDICATES FUTURE GRASS VERGE

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
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Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: SANDYFORD ENVIRONMENTAL CONSTRUCTON LTD

ARCHITECT: MC CAULEY DAYE O'CONNELL

PROJECT: TACK SANDYFORD SHD

TITLE: PROPOSED FOUL & SURFACE WATER DRAINAGE LAYOUT

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	BMC	JG	MAR. '22
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	21-118	P124	

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

28 March 2022 10:23 -- DRAFT -- Laura Ruiz Garrido

Ex. FW CL: 81.80 IL: 79.32

EX 225ø

Ex. FW CL: 84.10 IL: 81.23

ø225 @ 1:80.4

EX 450ø

EX 300ø

Ex. SW CL: 85.06 IL: 81.57

F MH 12 CL 84.300 IL 81.535

ø225 @ 1:55.5

F MH 11 CL 84.000 IL 81.848

Ex. SW CL: 84.25 IL: 81.00

EX 225ø

Ex. FW CL: 83.92 IL: 82.01

Ex. FW CL: 83.79 IL: 81.90

CARMANHALL ROAD

F MH 10 CL 83.980 IL 81.889

ø225 @ 1:180

RAVENS ROCK ROAD

FFL 84.82

FFL 86.125

FFL 86.615

FFL 84.15

FFL 85.00

SURFACE WATER ATTENUATION
12m x 16.6m x 2m Deep
Top of tank 83.8
IL 81.8

ø225 @ 1:108.6

F MH 8 CL 84.100 IL 82.370

ø225 @ 1:109.7

F MH 9 CL 84.175 IL 82.050

F MH 6 CL 84.100 IL 82.520

Down Pipe from Podium Drainage

F MH 3 S/O CL 84.100 IL 82.750

RISING MAIN FROM BASEMENT

F MH 4 CL 84.420 IL 82.183

GULLY TO BASEMENT DRAINAGE

GULLY TO BASEMENT DRAINAGE

TAXI SET DOWN

PEDESTRIAN LINK BRIDGE

Ex. SW CL: 87.22 IL: 84.39

ø225 @ 1:44.2

F MH 1 CL 84.100 IL 83.100

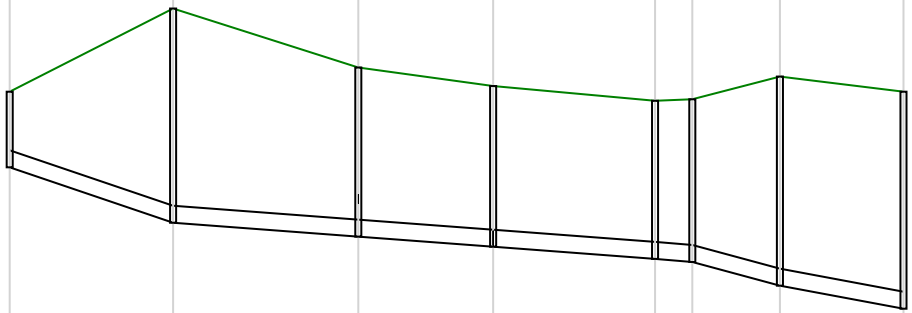
F MH 2 CL 85.200 IL 82.367

15.54

13.21

7.82

Mar 28, 2022 - 10:23am Drawing Location: M:\Projects\21\21-118 - Ravens Rock\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\TACK PLANNING\21-118-P124 - Proposed Foul & Surface Water Drainage Layout.dwg

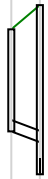


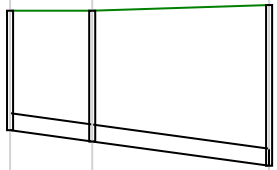
A4 drawing

Hor Scale 1500
Ver Scale 100

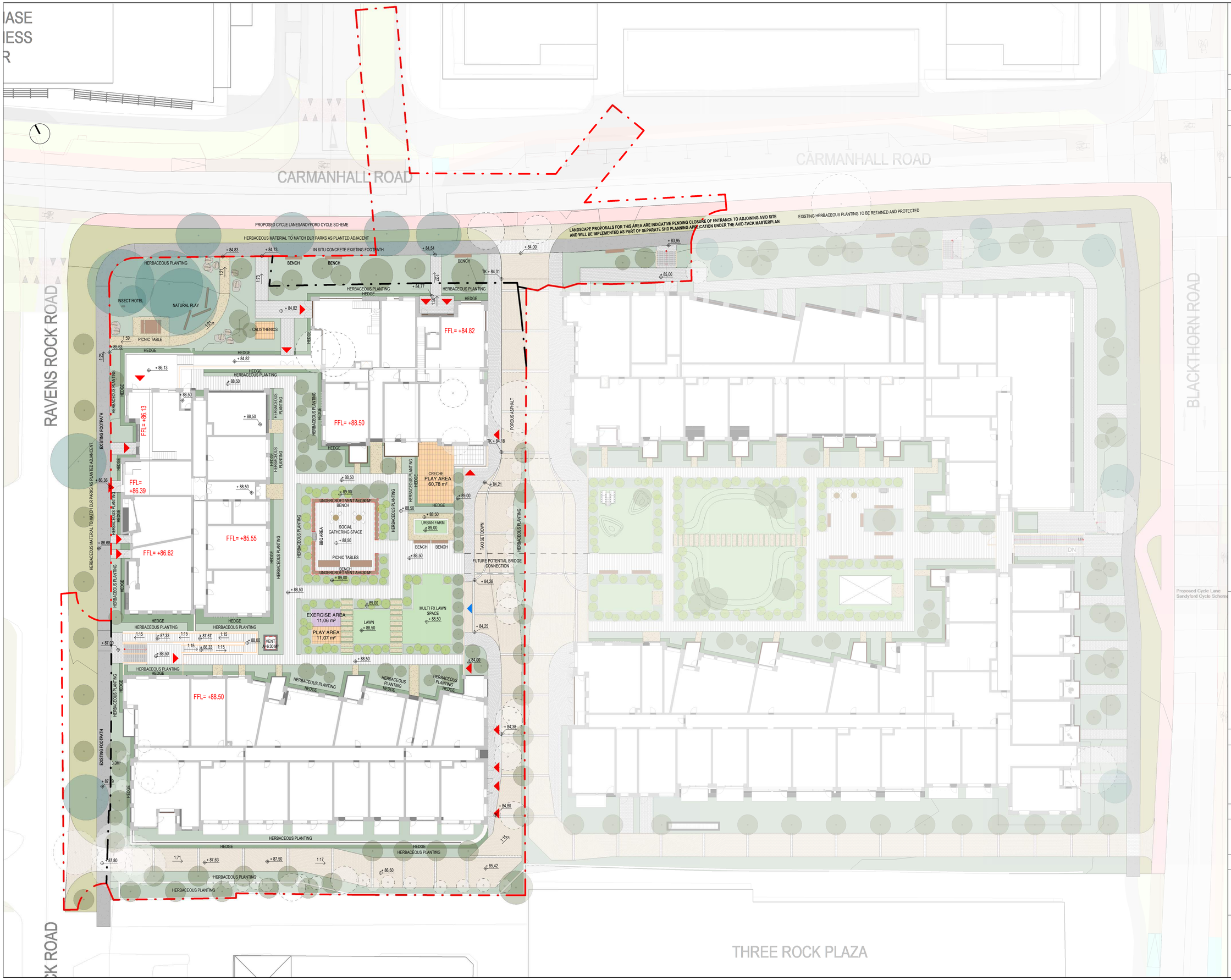
Datum (m) 77.000

Node Name	1	2	4	9	10	11	12	13
Link Name	1	2	4	9	10	11	12	
Section Type	225mm	225mm	225mm	225mm	225	225mm	225mm	
Slope (1:X)	44.2	200.0	201.1	200.0	180	55.5	80.4	
Cover Level (m)	84.100	85.200	84.420	84.175	83.980	84.000	84.300	84.100
Invert Level (m)	83.100	82.367 / 82.367	82.183 / 82.183	82.050 / 82.050	81.889 / 81.889	81.848	81.535 / 81.535	81.230
Length (m)	32.414	36.735	26.743	32.118	7.3	17.378	24.508	

Node Name		3 S4O
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 78.000		
Link Name		3
Section Type		15
Slope (1:X)		39
Cover Level (m)		84.100 84.420
Invert Level (m)		[illegible]
Length (m)		5.6

Node Name		6	8	9
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 77.000				
Link Name		6	8	
Section Type		225mm	225mm	
Slope (1:X)		108.6	109.7	
Cover Level (m)		84.100	84.100	84.175
Invert Level (m)		82.520 / 82.370	82.370	82.050
Length (m)		16.294	35.088	

UK and Ireland Office Locations



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Sandyford Environmental Construction Limited

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MDO ARCHITECTS

LEGEND

- HEDGE PLANTING
- HERBACEOUS PLANTING
- HERBACEOUS MATERIAL TO MATCH DLR PARKS AS PLANTED ADJACENT*
- LAWN
- GATE TO COMMUNAL AND PRIVATE AMENITY SPACES
- SITE BOUNDARY
- LEGAL INTEREST BOUNDARY
- BUILDING ENTRACE
- CAR PARK ENTRACE
- 0.00 LEVEL
- P CAR PARKING
- PUBLIC REALM PEARMABLE PAVING
- NATURAL STONE PAVING BAND
- SHARED SURFACE POROUS ASPHALT
- IN SITU CONCRETE EXISTING FOOTPATH
- RESIN BOUND GRAVEL
- COURTYARD PAVING
- SOFT POUR PLAYGROUND FINISH
- PROPOSED TREES
- EXISTING TREES TO BE RETAINED
- LARGE SHRUBS PLANTING
- EXISTING TREES TO BE REMOVED

* ON CARMANHALL ROAD AND BLACKTHORN ROAD

DRAFT

01	BOUNDARY LINE	15/03/2022
02	SURFACE TREATMENT	31/03/2022

REVISIONS

Job No.	18A5A	Drawn By	NN
Dwg No.	T-L1-500	Checked By	JM
Scale	1 : 250 @A1	Date	MARCH 2022

JOB DESCRIPTION

Site	RAVENS ROCK ROAD
Project	TACK SANDYFORD SHD
Title	LANDSCAPE PLAN

NMP Niall Montgomery + Partners
Architects 33 Rock Road, Williamstown, Blackrock, Co. Dublin
Telephones : 2121 800 Fax : 2121 007 E mail : info@nmp.ie

Appendix C Storm Water Audit Feedback Form

STORM WATER AUDIT FEEDBACK FORM

Scheme: Proposed Residential Development at: Tack Site, Sandyford

Area: Residential

Audit Stage: 1 **Date Audit Completed:** 06/04/2022 **Our Ref :** 221140

Paragraph No. in Audit Report	Problem Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.1.1	Yes	Yes	Please refer to drawings P190 which shows an indicative layout with FFL for each of the levels to provide clarity.	
2.1.2	Yes	Yes	Refer to drawings P120, P121,P122, P123 and P124 showing the proposed car parking drainage at B1 lower ground level (undercroft car parking) and B2 Basement level.	
2.1.3	Yes	Yes	Suds finishes are indicated in updated drawing P125. In addition, please find attached with this response landscape drawing T-L1-500 showing final surfaces for the overall development.	
2.1.4	Yes	Yes	A sump has been added to SW MH20 upstream of the petrol interceptor and attenuation tank on site.	
2.1.5	Yes	Yes	Refer to drawing P120 showing connections from the permeable surfaces into the wider surface water network. In addition, refer to drawing P126 showing details of the perforated pipes that run under the permeable paving to collect the water.	
2.1.6	Yes	Yes	Following consultation with Dun Laoaghaire Rathdown County Council on this matter it has been agreed that the hydro-brake provided should be set to 1.8 l/s, with a 57 mm orifice.	

STORM WATER AUDIT FEEDBACK FORM

Paragraph No. in Audit Report	Problem Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.1.7	Yes	N/A	A GPR survey has been undertaken and overlaid on the proposed drainage works. Refer to drawing P128 showing a zoomed in area of the existing services at the connection points. There are no clashes based on this overlay.	Yes
2.1.8	Yes	Yes	Refer to Section 3.6 of FRA for an analysis on potential blockages. In addition, refer to drawing P125 showing the overland flood route for the site.	
2.2.1	N/A	N/A	Coordination has been carried out with Architect and M&E Consultant in respect of the green roof / PV panel co-ordination.	Yes
2.2.2	Yes	No	Rainwater harvesting was considered however it was ruled out in favour of incorporating green roofs in line with DLRCC policy. There is limited benefit providing the rainwater harvesting in such circumstances and it was omitted on this basis	Yes

Signed: Laura Ruiz **Design Team Project Manager** **Date:** : 01/04/2022

Please complete and return to the auditor

Auditor Signed Off:  **Date:** 06/04/2022