Technical Note

CLIENT:	**TILLICOULTRY QUARRIES LIMITED**
PROJECT:	**TILLICOULTRY QUARRIES COATED STONE PLANT, ELY**
SUBJECT:	**SURFACE WATER MANAGEMENT (PLANNING CONDITION 7)**
JOB NO.:	**NT16548**
DATE:	**28 FEBRUARY 2024**
PREPARED BY:	**BRYN GRIFFITHS**

1 INTRODUCTION

1.1 This Technical Note has been prepared to support the discharge of Planning Condition 7 (Surface Water Management) outlined in Cambridgeshire County Council Decision Notice Ref: CCC/22/108/FUL, issued on 26 September 2023.

1.2 This Technical Note is divided into sections, which correspond with items A to H within the Planning Conditions document.

2 SURFACE WATER MANAGEMENT PLAN (ITEMS A - C)

2.1 The surface water drainage proposals are shown in Drawing No. NT16548-100 'Proposed Surface Water Drainage Layout'. This is based on the conceptual scheme within the Technical Note (ref: ED13486/TECHNICAL NOTE 1) produced on 19 June 2023 and approved through planning.

2.2 The existing site is a brownfield site within a larger industrial development. Historical site investigation works confirmed the presence of Made Ground across all areas of the industrial estate, including within the site. Historical land use mapping provided by Groundsure (see Figure 1) shows that the southern portion of the site was used for landfilling until 1981.

2.3 It is considered that infiltration drainage will not be viable within the proposed development and surface water runoff will, therefore, be discharged to the unnamed watercourse extending through the centre of the site at a restricted rate of 2 l/s.

2.4 The site is divided into a northern and southern area either side of the watercourse, connected by a single bridge crossing. It is not, therefore, possible to use any formal drainage infrastructure such as pipes or drainage ditches to connect the two areas and

form a single drainage network. Surface water runoff from northern and southern portions of the site will, therefore, be retained within the respective areas of the site and redistributed by pumping.

2.5 There is a lack of open space within the northern area of the site, and it will not be feasible to provide all of the necessary attenuation for runoff generated within this area of the site. Additional attenuation will, therefore, be provided within the southern area and where additional storage capacity is required in the northern area, water will be pumped to the southern site area.

2.6 Due to the potential for made ground within the site, it is proposed to keep excavation to a minimum and attenuation will be provided in shallow detention basins rather than underground storage features such as geocellular tanks.

2.7 The outfall to the watercourse will be from the southern lagoon, with water pumped at the restricted rate of 2 l/s, considered the lowest feasible discharge rate and as approved in Technical Note (ref: ED13486/TECHNICAL NOTE 1). Pumping within the site between northern and southern areas of the site will be restricted to 15 l/s with no pathway off site.

2.8 The proposed surface water drainage network had been modelled using Causeway's 'Flow' drainage modelling software. The results are contained in Appendix 1 and show that the sufficient attenuation is provided within the network attenuation for the QBAR, 1 in 30, 1 in 100 and 1 in 100 (plus 40% climate change allowance) storm events.

2.9 The Surface Water Management Plan (Drawing No. NT16548-100 'Proposed Surface Water Drainage Layout') shows the location and dimensions of the detention basins. Cross sections of these features are shown on Drawing No NT16548-100.

3 CCTV SURVEY OF THE DRAINAGE NETWORK (ITEM D)

3.1 The culvert downstream of the proposed development was heavily surcharged and overgrown (see Figure 1 and 2 below) and it was not possible to conduct a CCTV survey. Work would be required to clear the channel before this could take place.

Figure 1. Culvert inlet looking westwards towards open channel

Figure 2. Culvert inlet looking westwards towards open channel

3.2 A previous CCTV survey undertaken in January 2021 at the site and wider industrial area also found the network to be surcharged with land in several areas downstream of the site inaccessible. The survey confirms an incoming 450mm diameter connection into a manhole chamber approximately 55m to the east of the development which is aligned approximately with the route of the open channel within the site and it is, therefore, considered that this is the downstream route of the culvert. This then

continues south-eastwards downstream of the manhole chamber. This follows the route of a historic watercourse within the site area as shown on Figure 3 and 4 below.

3.3 An extract of the 2021 survey drawing is included on Drawing No. NT16548-100 'Proposed Surface Water Drainage Layout'.

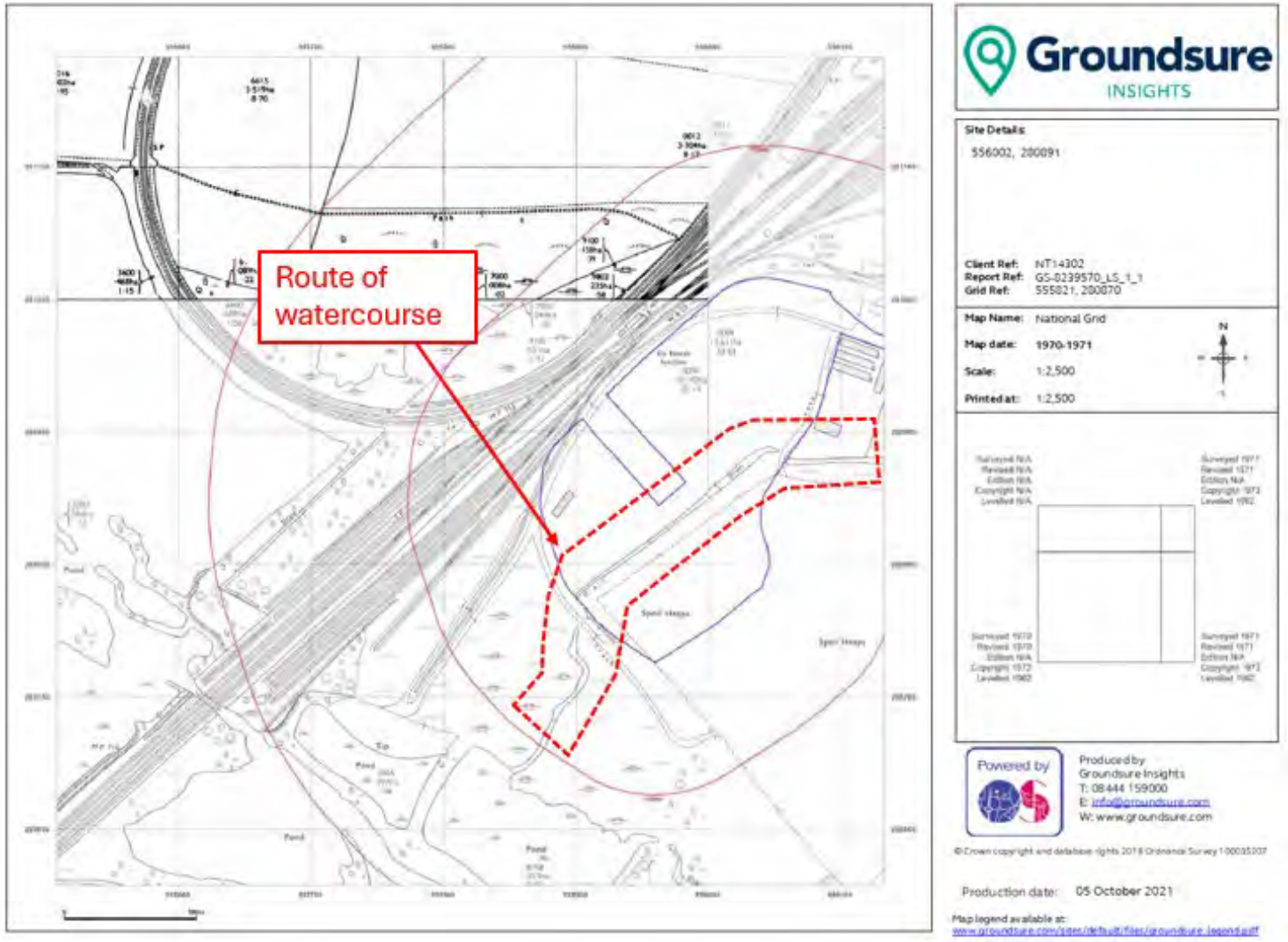


Figure 3. 1971 Ordnance Survey Map Extract (Site Area)

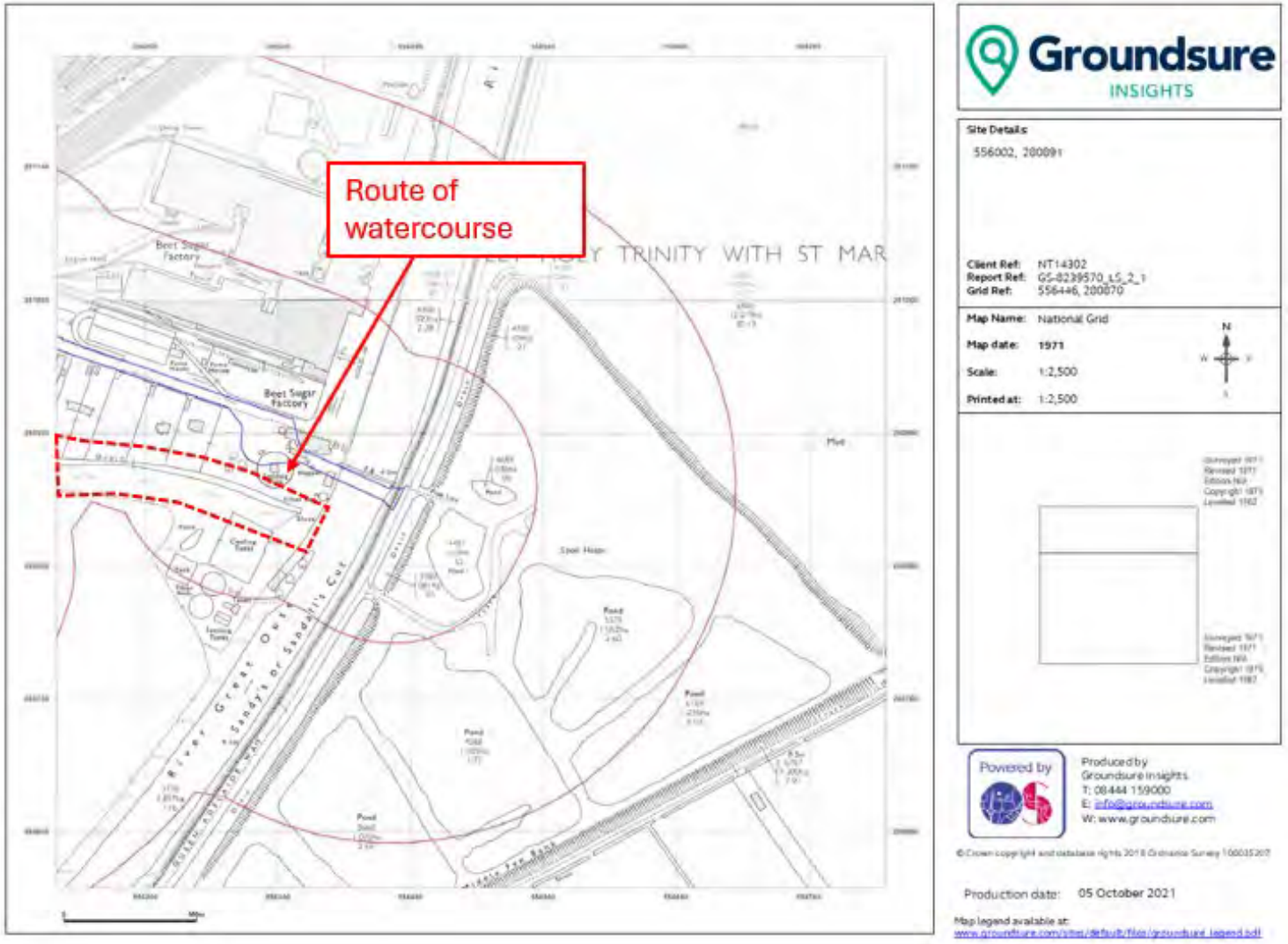


Figure 4. 1971 Ordnance Survey Map Extract (East of Site Area)

4 OVERLAND FLOW AND EXCEEDANCE FLOWS (ITEM E)

4.1 Sufficient attenuation will be provided within the detention basins for the 1 in 100 year storm event (plus a 40% allowance for climate change). An extreme rainfall event above the 1 in 100 year (+40% climate change allowance) event may, therefore, exceed the capacity of the detention basin network and cause flooding.

4.2 Similarly a failure of the pumping systems during a storm event, may also cause flooding when water cannot be discharged from the site. Potential exceedance flow routes during these scenarios are shown on Drawing No. NT16548-100

4.3 As shown on Drawing No. NT16548-100, the layout of the site means that there are no pathways for exceedance flows to run off site and these will be retained by existing or proposed bunds with no impact on downstream areas. The offices and welfare building are located outside of areas where exceedance flows could accumulate and there would be no risk to site operatives.

5 ACCORDANCE WITH RELEVANT TECHNICAL STANDARDS (ITEM F)

5.1 The DEFRA 'Non-Statutory Technical Standards for Sustainable Drainage Systems' report[1] contains 14 no. standards which sustainable drainage systems should meet. Several standards do not apply to the proposed development as a brownfield development, however, the relevant standards are summarised below.

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

[1] DEFRA (2015) Sustainable Drainage Systems: Non-Statutory Technical Stands for Sustainable Drainage Systems (reference: PB14308)

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with **S4** or **S5** above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

5.2 Based on the HR Wallingford 'Greenfield Runoff Rate Estimation for Sites' tool, the greenfield runoff rates in the vicinity of the site are:

- 1 in 1 year: 0.11 l/s/ha
- QBAR: 0.12 l/s/ha
- 1 in 30 years: 0.31 l/s/ha
- 1 in 100 years: 0.44 l/s/ha

5.3 The site has an area of approximately 4 hectares and the greenfield runoff rate would, therefore, be 0.44 l/s for the 1 in 1 year event and 1.76 l/s for the 1 in 100 year event. It is, therefore, not feasible to discharge runoff at these rates and discharge will be restricted to 2 l/s, which was approved as part of the planning application for the proposed development.

S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

5.4 As shown in the modelling data (see Appendix 1), the surface water drainage network will provide sufficient attenuation for all storm events up to and including the 1 in 100 year (+40%) storm event with no flooding. As shown on Drawing No. NT16548-100, exceedance flows will be retained on site with no risk to site operatives.

S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

5.5 The proposed detention basins will be located away from vehicle routes and all drainage infrastructure will be located above ground, with no risk of damage and straightforward access for maintenance.

S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

5.6 The proposed detention basins will be lined with clay. This will be suitably compacted when installed to prevent infiltration. The proposed pumps will also be of suitable specification.

S12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

5.7 It will not be possible to discharge to the watercourse via gravity and it would not be feasible to use piped drainage to convey runoff from the northern portion of the site to the outfall in the south of the site. Pumping will, therefore, be required within the proposed development.

S13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.

S14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

5.8 There are no public sewers within the site area and minimal private drainage infrastructure and there will, therefore, be no risk of damage to any existing drainage network.

6 MAINTENANCE AND ADOPTION (ITEM G)

6.1 The proposed surface water drainage network will incorporate clay-lined detention basins. An example of the maintenance requirements is included in Table 1 below, based on Table 22.1 of the CIRIA SuDS Manual.

Table 1. Detention Basin Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter/debris	Monthly
	Manage vegetation/nuisance plants	Monthly/as required
	Inspect inlets/outlets/overflows for blockages	Monthly
	Inspect banksides/structures for physical damage	Monthly
	Remove sediment from inlets/outlets	Annually/as required
Occasional Maintenance	Remove sediment from inlets/outlets and main basin	Every 5 years (assuming effective upstream source control)
Remedial Actions	Repair damage to clay lining	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

6.2 The pumping equipment will be managed in accordance with the manufacturer's specifications.

7 POLLUTION OF GROUNDWATER AND SURFACE WATER (ITEM H)

7.1 Attenuation will be provided within detention basins which will be lined with clay to prevent infiltration to ground. Surface water will drain to the detention basins via overland flow. The existing surfacing within the site is a mixture of hardstanding and loose compacted mineral and any infiltration can be expected to be minimal. There will, therefore, be no pathway for surface water runoff to infiltrate to ground and impact the underlying groundwater as a result of the proposed development.

7.2 The watercourse flowing through the centre of the site will be protected by bunding and there will be no pathway for surface water runoff to flow directly into the watercourse.

7.3 Surface water runoff will be retained within detention basins to allow for the settlement of sediments and will be pumped to the watercourse via an oil interceptor which will provide a second stage of treatment prior to discharge.

7.4 General good practices will be followed on site with regards to storing fuels and chemicals, and retaining and remediating spillages with no pathway for this to flow off site.

APPENDIX 1

Drainage Network Modelling Results

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	5.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
LAGOON NORTH	0.597	5.00	4.500	1200	555909.049	280798.129	1.000
PUMP 1			4.400	1800	555922.077	280793.836	1.900
LAGOON SOUTH	0.720	5.00	4.200	1200	555942.469	280765.401	2.000
PUMP 2			4.400	1200	555937.762	280769.762	2.400
1			5.525	1200	555929.133	280781.763	1.525
2			5.218	1200	555921.464	280785.513	1.718
OUTFALL			4.825		555916.607	280787.637	1.425

Links

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)
1.000	LAGOON NORTH	PUMP 1	13.717	0.600	3.500	2.500	1.000	13.7	225	5.00	50.0
1.001	PUMP 1	LAGOON SOUTH	34.991	0.600	3.500	2.200	1.300	26.9	225	5.00	50.0
1.002	LAGOON SOUTH	PUMP 2	6.417	0.600	2.200	2.000	0.200	32.1	300	5.00	50.0
1.003	PUMP 2	1	14.781	0.600	2.650	4.000	-1.350	-10.9	225	5.00	50.0
1.004	1	2	8.537	0.600	4.000	3.500	0.500	17.1	225	5.00	50.0
1.005	2	OUTFALL	5.301	0.600	3.500	3.400	0.100	53.0	300	5.00	50.0

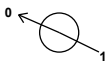
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.551	141.2	113.3	0.775	1.675	0.597	0.0	153	3.935
1.001	2.531	100.7	113.3	0.675	1.775	0.597	0.0	225	2.578
1.002	2.785	196.9	250.0	1.700	2.100	1.317	0.0	300	2.821
1.003	1.000	39.8	250.0	1.525	1.300	1.317	0.0	225	0.000
1.004	3.182	126.5	250.0	1.300	1.493	1.317	0.0	225	3.240
1.005	2.164	152.9	250.0	1.418	1.125	1.317	0.0	300	2.192

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	13.717	13.7	225	Circular	4.500	3.500	0.775	4.400	2.500	1.675
1.001	34.991	26.9	225	Circular	4.400	3.500	0.675	4.200	2.200	1.775
1.002	6.417	32.1	300	Circular	4.200	2.200	1.700	4.400	2.000	2.100
1.003	14.781	-10.9	225	Circular	4.400	2.650	1.525	5.525	4.000	1.300
1.004	8.537	17.1	225	Circular	5.525	4.000	1.300	5.218	3.500	1.493
1.005	5.301	53.0	300	Circular	5.218	3.500	1.418	4.825	3.400	1.125

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	LAGOON NORTH	1200	Manhole	Adoptable	PUMP 1	1800	Manhole	Adoptable
1.001	PUMP 1	1800	Manhole	Adoptable	LAGOON SOUTH	1200	Manhole	Adoptable
1.002	LAGOON SOUTH	1200	Manhole	Adoptable	PUMP 2	1200	Manhole	Adoptable
1.003	PUMP 2	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable
1.004	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.005	2	1200	Manhole	Adoptable	OUTFALL		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
LAGOON NORTH	555909.049	280798.129	4.500	1.000	1200				
						0	1.000	3.500	225
PUMP 1	555922.077	280793.836	4.400	1.900	1800	1	1.000	2.500	225
									
						0	1.001	3.500	225
LAGOON SOUTH	555942.469	280765.401	4.200	2.000	1200	1	1.001	2.200	225
									
						0	1.002	2.200	300
PUMP 2	555937.762	280769.762	4.400	2.400	1200	1	1.002	2.000	300
									
						0	1.003	2.650	225
1	555929.133	280781.763	5.525	1.525	1200	1	1.003	4.000	225
									
						0	1.004	4.000	225
2	555921.464	280785.513	5.218	1.718	1200	1	1.004	3.500	225
									
						0	1.005	3.500	300
OUTFALL	555916.607	280787.637	4.825	1.425		1	1.005	3.400	300
									

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Summer CV	0.750	Check Discharge Volume	x
Analysis Speed	Normal		

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 %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node PUMP 1 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	3.500	Design Flow (l/s)	100.0
Replaces Downstream Link	✓	Design Depth (m)	1.900		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.010	15.000	1.900	15.000

Node PUMP 2 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	2.650	Design Flow (l/s)	2.0
Replaces Downstream Link	✓	Design Depth (m)	2.400		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.000	2.400	2.000

Node LAGOON NORTH Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	148

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	220.0	0.0	1.000	220.0	0.0

Node LAGOON SOUTH Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	480

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1350.0	0.0	1.000	1350.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	LAGOON NORTH	42	3.629	0.129	54.0	30.0333	0.0000	OK
60 minute summer	PUMP 1	42	3.621	1.121	17.7	2.8531	0.0000	OK
10080 minute summer	LAGOON SOUTH	10320	2.590	0.390	5.1	529.2947	0.0000	SURCHARGED
10080 minute summer	PUMP 2	10260	2.590	0.590	0.0	0.6669	0.0000	OK
15 minute summer	1	1	4.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	1	3.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	OUTFALL	1	3.400	0.000	0.0	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)
60 minute summer	LAGOON NORTH	1.000	PUMP 1	17.7	0.709	0.126	0.4340	
60 minute summer	PUMP 1	Depth/Flow	LAGOON SOUTH	15.0				
10080 minute summer	LAGOON SOUTH	1.002	PUMP 2	0.0	0.027	0.000	0.4519	
10080 minute summer	PUMP 2	Depth/Flow	1	0.0				
15 minute summer	1	1.004	2	0.0	0.000	0.000	0.0000	
15 minute summer	2	1.005	OUTFALL	0.0	0.000	0.000	0.0000	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	LAGOON NORTH	55	3.901	0.401	130.2	93.4470	0.0000	SURCHARGED
60 minute summer	PUMP 1	55	3.885	1.385	16.6	3.5257	0.0000	SURCHARGED
10080 minute summer	LAGOON SOUTH	6540	2.731	0.531	8.3	720.6801	0.0000	SURCHARGED
10080 minute summer	PUMP 2	6540	2.731	0.731	1.6	0.8262	0.0000	OK
10080 minute summer	1	6540	4.018	0.018	1.6	0.0202	0.0000	OK
10080 minute summer	2	6540	3.522	0.022	1.6	0.0250	0.0000	OK
10080 minute summer	OUTFALL	6540	3.422	0.022	1.6	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)
60 minute summer	LAGOON NORTH	1.000	PUMP 1	16.6	0.885	0.117	0.5455	
60 minute summer	PUMP 1	Depth/Flow	LAGOON SOUTH	15.0				
10080 minute summer	LAGOON SOUTH	1.002	PUMP 2	1.6	0.023	0.008	0.4519	
10080 minute summer	PUMP 2	Depth/Flow	1	1.6				
10080 minute summer	1	1.004	2	1.6	0.939	0.013	0.0148	
10080 minute summer	2	1.005	OUTFALL	1.6	0.704	0.011	0.0121	312.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	LAGOON NORTH	61	4.071	0.571	171.1	133.1980	0.0000	SURCHARGED
60 minute summer	PUMP 1	61	4.056	1.556	17.0	3.9598	0.0000	SURCHARGED
10080 minute summer	LAGOON SOUTH	6540	2.805	0.605	6.5	822.4551	0.0000	SURCHARGED
10080 minute summer	PUMP 2	6540	2.805	0.805	2.0	0.9110	0.0000	OK
1440 minute summer	1	1350	4.020	0.020	2.0	0.0224	0.0000	OK
1440 minute summer	2	1350	3.524	0.024	2.0	0.0277	0.0000	OK
1440 minute summer	OUTFALL	1350	3.424	0.024	2.0	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)
60 minute summer	LAGOON NORTH	1.000	PUMP 1	17.0	0.951	0.121	0.5455	
60 minute summer	PUMP 1	Depth/Flow	LAGOON SOUTH	15.0				
10080 minute summer	LAGOON SOUTH	1.002	PUMP 2	2.0	0.028	0.010	0.4519	
10080 minute summer	PUMP 2	Depth/Flow	1	2.0				
1440 minute summer	1	1.004	2	2.0	0.998	0.016	0.0171	
1440 minute summer	2	1.005	OUTFALL	2.0	0.752	0.013	0.0141	78.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.26%

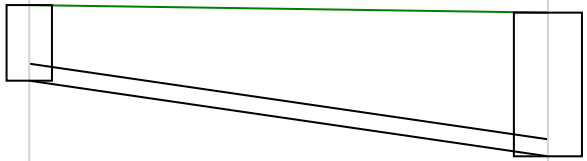
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	LAGOON NORTH	116	4.389	0.889	154.1	207.1794	0.0000	FLOOD RISK
120 minute summer	PUMP 1	116	4.373	1.873	16.5	4.7675	0.0000	FLOOD RISK
7200 minute summer	LAGOON SOUTH	5400	3.055	0.855	13.5	1161.0100	0.0000	SURCHARGED
7200 minute summer	PUMP 2	5400	3.055	1.055	2.0	1.1929	0.0000	SURCHARGED
360 minute summer	1	392	4.020	0.020	2.0	0.0224	0.0000	OK
240 minute summer	2	404	3.524	0.024	2.0	0.0277	0.0000	OK
240 minute summer	OUTFALL	404	3.424	0.024	2.0	0.0000	0.0000	OK

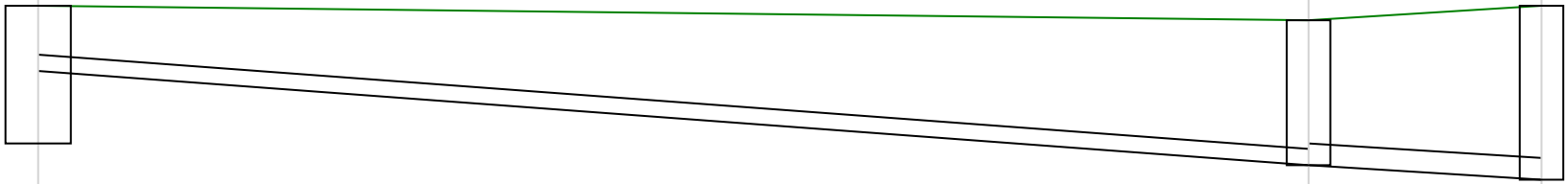
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	LAGOON NORTH	1.000	PUMP 1	16.5	0.901	0.117	0.5455	
120 minute summer	PUMP 1	Depth/Flow	LAGOON SOUTH	15.0				
7200 minute summer	LAGOON SOUTH	1.002	PUMP 2	2.0	0.041	0.010	0.4519	
7200 minute summer	PUMP 2	Depth/Flow	1	2.0				
360 minute summer	1	1.004	2	2.0	0.998	0.016	0.0171	
240 minute summer	2	1.005	OUTFALL	2.0	0.752	0.013	0.0141	19.1

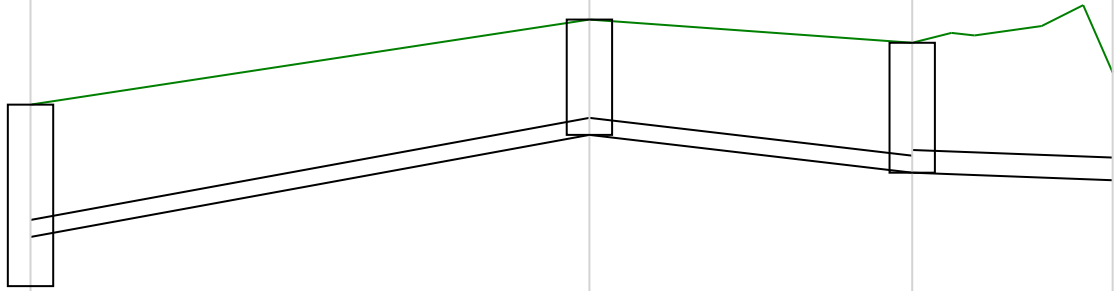
Pump rate within site 15 l/s

Pump rate to outfall 2l/s

Attenuation: 207m3 (North) 1161m3 (South)

Node Name		LAGOON NORTH	PUMP 1
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) -2.000			
Link Name		1.000	
Section Type		225mm	
Slope (1:X)		13.7	
Cover Level (m)		4.500	4.400
Invert Level (m)		3.500	2.500
Length (m)		13.717	

Node Name		PUMP 1		LAGOON SOUTH	PUMP 2
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) -3.000					
Link Name		1.001		1.002	
Section Type		225mm		300mm	
Slope (1:X)		26.9		32.1	
Cover Level (m)		4.400		4.200	4.400
Invert Level (m)		3.500	2.200	2.200	2.000
Length (m)		34.991		6.417	

Node Name	PUMP 2	1	2	OUTFALL
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) -2.000				
Link Name	1.003	1.004	1.005	
Section Type	225mm	225mm	300mm	
Slope (1:X)	-10.9	17.1	53.0	
Cover Level (m)	4.400	5.525	5.218	4.825
Invert Level (m)	2.650	4.000 / 4.000	3.500 / 3.500	3.400
Length (m)	14.781	8.537	5.301	

DRAWINGS


EXISTING AGGREGATE STORAGE BAYS PROVIDE BARRIER TO FLOWS LEAVING SITE
NEW BUND TO RETAIN RUNOFF WITHIN SITE IN EVENT OF OVERFLOW
SWALE/LAND DRAIN - 120m @ 1 IN 200
MP 71.75
Conveyor
EXISTING SITE LEVELS AMENDED UNDER PROPOSAL TO FALL TOWARDS DETENTION BASINS/SWALE
EXISTING OPEN CHANNEL APPROXIMATE INVERT LEVEL 2.70m
ASSUMED DOWNSTREAM ROUTE (UNABLE TO SURVEY)
PROPOSED STORAGE BAYS
AGGREGATE BUNKERS
+4.600
+4.500
NO OVERLAND FLOW ROUTE TO EXISTING DITCH
BARRIERS INSTALLED TO PREVENT INGRESS OF RUN-OFF INTO CHANNEL
PROPOSED STONE COATING PLANT
EVACUATION ROUTE FROM PLANT / WEIGHBRIDGE / OFFICES
PROPOSED RELOCATED WEIGHBRIDGES AND WEIGHBRIDGE OFFICE
TYPE B MANHOLE 2.0m DIA COVER LEVEL: 4.400m INVERT LEVEL-SEE NOTE 1
BASE of DETENTION BASIN 1 3.500
210m³ STORAGE PROVIDED @ 1.0m DEEP
EXISTING 550mØ CULVERT
PROPRIETARY TREATMENT SYSTEM SUCH AS SPEL STORMCEPTOR CLASS 1 BY-PASS SEPARATOR ESR RANGE (OR SIMILAR) TO BE INSTALLED UPSTREAM OF OUTFALLS TO WATERCOURSE
EXISTING BUND PREVENTS RUNOFF TO WATERCOURSE IN EVENT OF PUMP FAILURE
EX BED LEVEL 2.800
PUMP RISING MAIN-225mm DIA 34.991m @ 1:70 (1) OR 1:28.3 (2)
PUMP RISING MAIN 225mm DIA 14.8m @ 1:X.4
TYPE B MANHOLE 1.2m DIA COVER LEVEL: 5.220m INVERT LEVEL: 3.500m
TYPE B MANHOLE 1.2m DIA COVER LEVEL: 5.525m INVERT LEVEL: 4.000m
TYPE B MANHOLE WITH PUMP 2.0m DIA FLOW RESTRICTED TO 2l/sec COVER LEVEL: 4.400m INVERT LEVEL: 2.000m
TYPE B MANHOLE 1.2m DIA COVER LEVEL: 4.200m INVERT LEVEL: 2.300m
EXISTING SITE LEVELS AMENDED UNDER PROPOSAL TO FALL TOWARDS DETENTION BASINS
NOTE 1:
ARRANGEMENT 1: PUMP WITHIN THE CHAMBER TO PUMP OVER THE TOP OF THE CULVERT AT 15l/s IN THE CASE THAT THE INVERT LEVEL IS FOUND TO BE HIGHER THAN 2.8m, TO AVOID CLASH WITH EXISTING CULVERT.
INLET INVERT LEVEL=2.5m OUTLET INVERT LEVEL=3.5m
ALTERNATIVE ARRANGEMENT 2: UNRESTRICTED CHAMBER DRAINING VIA GRAVITY TO DETENTION BASIN 2. THIS ARRANGEMENT ASSUMES THAT THE CULVERT INVERT LEVEL IS 2.8m, THIS LEVEL MUST BE CONFIRMED ON SITE BEFORE ANY WORKS COMMENCE. INLET INVERT LEVEL=OUTLET INVERT LEVEL=2.5m
NOTE: PUMP SPECIFICATIONS TBC
+4.200
BASE of DETENTION BASIN 2 2.200
EXISTING SITE OFFICE RETAINED
HGV SWEPT PATH
SITE STORAGE AREA RETAINED (BUNDED IF REQUIRED TO PREVENT INGRESS OF TEMPORARY FLOODING)
WB
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DO NOT SCALE FROM THIS DRAWING

NOTES:

1. TO BE READ IN CONJUNCTION WITH TECHNICAL NOTE REF: ED13486/TECHNICAL NOTE 1 (JUNE 2023)
2. LAYOUT IS INDICATIVE AND SUBJECT TO DETAILED DESIGN.
3. PUMPING ROUTES INDICATIVE. ASSUMING A MOVEABLE PUMP. IF MORE THAN ONE PUMP IS TO BE USED MAXIMUM TOTAL RATE OF PUMPING FROM SITE WILL NOT EXCEED 2 L/S
4. SURFACE WATER TO BE TREATED PRIOR TO DISCHARGE AND IN ACCORDANCE WITH THE PERMIT(S)
5. OVERLAND FLOW ROUTES BASED ON EXISTING TOPOGRAPHY. PROPOSED LEVELS DESIGN TO ENSURE FLOWS ARE DIRECTED TO THE DETENTION BASINS
6. PLEASE NOTE THESE DRAWINGS ARE NOT FOR CONSTRUCTION

KEY

- SITE BOUNDARY
- EXISTING WATERCOURSE (OPEN CHANNEL)
- EXISTING WATERCOURSE (CULVERTED)
- PROPOSED SURFACE WATER
- PROPOSED BUND / BARRIER
- RISING MAIN
- EXISTING CULVERT
- OVERLAND FLOW ROUTE
- PROPOSED POND
- PROPOSED HEADWALL
- PROPOSED SWALE

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
P0	FIRST ISSUE	28/02/24	LJI	JG	JG

CLIENT
TILLICOULTRY QUARRIES LTD

PROJECT
REPLACEMENT OF COATED STONE PLANT ELY

DRAWING TITLE
DRAINAGE LAYOUT

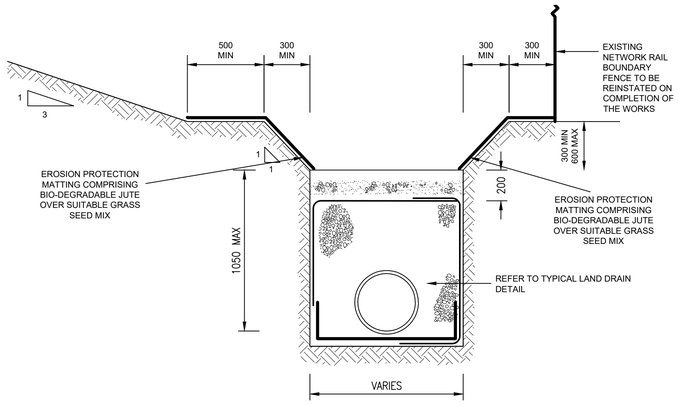
PRELIMINARY

DRG No.	REV	SUIT. CODE
NT16548-100	P0	

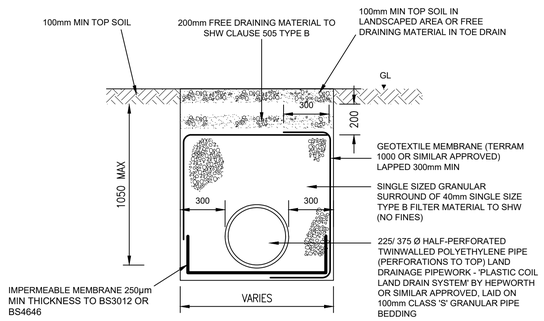
DRG SIZE	SCALE	DATE
A0	1:250	23/01/2024

DRAWN BY	CHECKED BY	APPROVED BY
LJI	JG	JG

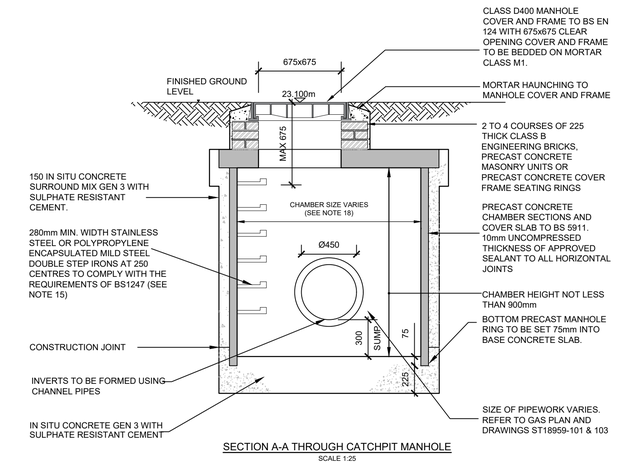
wardell armstrong



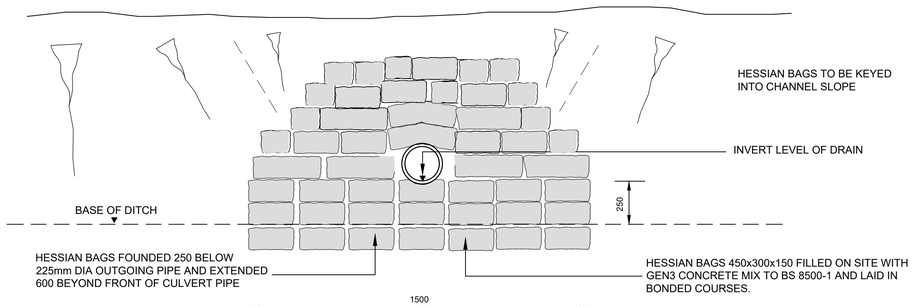
TYPICAL SECTION THROUGH TOE DRAIN
1:20



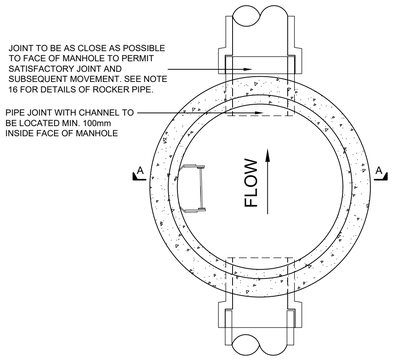
TYPICAL SECTION THROUGH LAND DRAIN
1:20



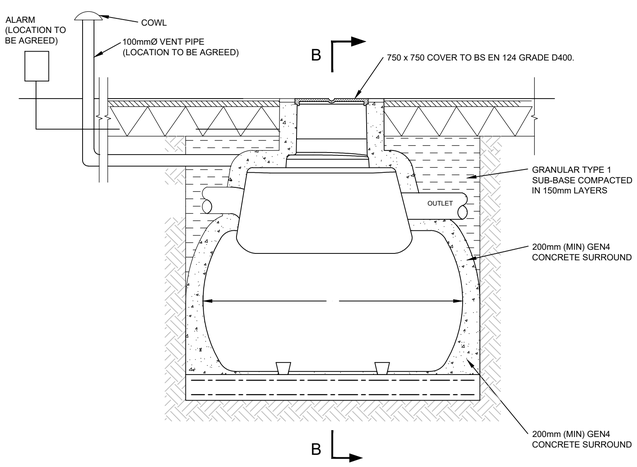
SECTION A-A THROUGH CATCHPIT MANHOLE
SCALE 1:25



TYPICAL SANDBAG HEADWALL DETAIL SECTION B-B
SCALE: 1:20

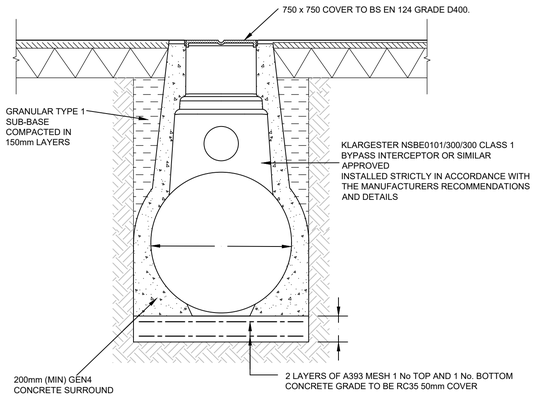


TYPICAL CATCHPIT MANHOLE DETAIL
SCALE 1:25

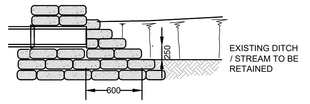


TYPICAL OIL INTERCEPTOR INSTALLATION
N.T.S

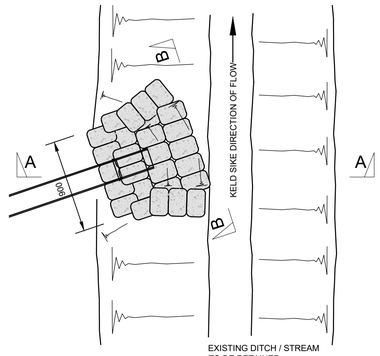
OIL INTERCEPTOR TO BE FITTED WITH MAINS POWERED SEPARATOR ALARM



SECTION B-B
N.T.S



TYPICAL SAND BAG HEADWALL SECTION A-A
SCALE: 1:500



TYPICAL SAND BAG HEADWALL PLAN
SCALE: 1:500

DO NOT SCALE FROM THIS DRAWING

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE.
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7. THE LOCATION OF EXISTING SEWERS SHOWN ON THIS DRAWING ARE INDICATIVE ONLY BASED ON KEELE UNIVERSITY ESTATE AND DEVELOPMENT DIRECTORATE SEWER RECORD PLANS AND TOPOGRAPHICAL INFORMATION. DEPTHS/INVERT LEVELS OF EXISTING SEWERS MUST BE CHECKED ON SITE PRIOR TO THE COMMENCEMENT OF ANY DRAINAGE WORKS.
8. ALL EXISTING DRAINAGE SHOWN ON THIS DRAWING IS INDICATIVE AND IS SHOWN FOR GUIDANCE ONLY. ALL EXISTING DRAINAGE RUNS MUST BE LOCATED AND TRACED ON SITE. ANY POTENTIAL CLASH WITH NEW PROPOSED DRAINAGE RUNS MUST BE REPORTED TO THE EMPLOYER'S REPRESENTATIVE PRIOR TO CONSTRUCTION.
9. ALL EXISTING SERVICES MUST BE LOCATED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS. WHERE NECESSARY, PROTECTION OR DIVERSIONS ARE TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORKS.
10. ALL MATERIALS UNLESS SPECIFIED OTHERWISE, SHALL COMPLY WITH RELEVANT BRITISH STANDARD. SOURCES OF MATERIALS ARE TO BE AGREED WITH THE EMPLOYERS REPRESENTATIVE IN ADVANCE OF WORKS.
11. ALL GRAVITY SEWERS AND DRAINAGE INCLUDING ADOPTABLE DRAINAGE AND FITTINGS TO BE FLEXIBLY JOINTED CLAYWARE TO BS EN 295 OR CONCRETE TO BS 5911 PART 100. FLEXIBLY JOINTED UPVC PIPES AND FITTINGS TO BE EN 1401-1 MAY BE USED FOR PRIVATE BUILDING DRAINAGE ONLY.
12. TYPICAL PIPE BEDDING TO DRAINAGE WHERE DEPTH TO SOFFIT IS GREATER THAN 600mm IN LANDSCAPED AREAS AND GREATER THAT 900mm IN OTHER TRAFFICKED AREAS IS TO BE CLASS S (I.E. 10-14mm GRADED IMPORTED GRANULAR BED AND SURROUND FOR PIPES UP TO 525mm DIAMETER AND 20 -40mm GRADED IMPORTED GRANULAR BED AND SURROUND FOR PIPES GREATER THAN 525mm DIAMETER).
13. WHERE DEPTH TO SOFFIT OF DRAINAGE PIPEWORK IS LESS THAN 600mm IN LANDSCAPED AREAS AND LESS THAN 900mm IN HARDSTANDING/TRAFFICKED AREAS THEN PIPEWORK IS TO BE PROTECTED WITH GEN3 MASS CONCRETE. COMPRESSIBLE MATERIAL, FLEXCELL OR SIMILAR, APPROXIMATELY 13mm THICK, IS TO BE PROVIDED AT EVERY PIPE JOINT.
14. BACKFILL TO DRAINAGE TRENCHES UNDER CARRIAGEWAYS TO BE TYPE 1 SUB-BASE MATERIAL, ELSEWHERE BACKFILL TO BE FREE DRAINING READILY COMPATIBLE MATERIAL, FREE FROM RUBBISH AND ORGANIC MATTER, FROZEN SOIL CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.
15. CONCRETE MIXES INDICATED ON THIS DRAWING ARE DESIGNATED MIXES CONFORMING TO BS 8500-1, 2006. ALL CONCRETE TO BE SULPHATE RESISTANT. CONTRACTOR TO MAKE ALLOWANCE FOR CARRYING OUT ADDITIONAL TESTING ON-SITE TO CONFIRM SULPHATE LEVEL CLASSIFICATION.
16. A FLEXIBLE JOINT SHALL BE PROVIDED AS CLOSE AS IS FEASIBLE TO OUTSIDE FACE OF ANY STRUCTURE INTO WHICH A PIPE IS BUILT, COMPATIBLE WITH THE SATISFACTORY COMPLETION AND SUBSEQUENT MOVEMENT OF THE JOINT. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE AS SHOWN IN THE TABLE BELOW.

NOMINAL DIAMETER (mm)	EFFECTIVE LENGTH (m)
150-600	0.6
675-750	1.0
825 AND OVER	1.25

17. ALL STEP IRONS TO BE STAINLESS STEEL (GRADE 316 S31 BS 5970) OR POLYPROPYLENE ENCAPSULATED TO BS 1247 PARTS 1-2, DOUBLE STEP RUNGS (280mm MIN WIDTH AT 250mm MAXIMUM CENTRES). MAXIMUM DISTANCE FROM COVER LEVEL TO FIRST STEP TO BE 675mm.
18. EXISTING DRAINAGE RUNS TO BE MADE REDUNDANT ARE TO BE JETTED AND RODDED THROUGH PRIOR TO BEING SEALED OFF. ALL RUNS TO BE MADE REDUNDANT ARE TO BE CHECKED BY CCTV FOR SADDLE CONNECTIONS. ANY SADDLE CONNECTIONS LOCATED ARE TO BE TRACED TO THEIR POINT OF ORIGIN AND THEN UNDER THE DIRECTION OF THE EMPLOYER'S REPRESENTATIVE ARE TO BE DIVERTED INTO NEW RUNS AS DEEMED NECESSARY.

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
P0	FIRST ISSUE	26/01/24	LJI	JG	JG

CLIENT
TILLICOULTRY QUARRIES LTD

PROJECT
ELY COATED STONE
NEW PLANT

DRAWING TITLE
CONSTRUCTION DETAILS
(SHEET 1 OF 4)

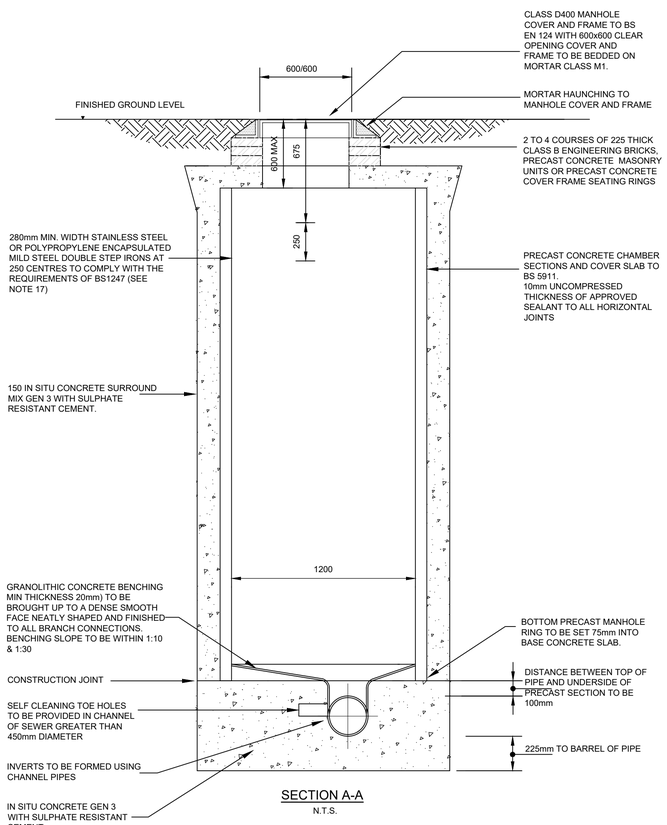
PRELIMINARY

DRG No.	REV	SUIT. CODE
NT16548-101	P0	

DRG SIZE	SCALE	DATE
A1	AS SHOWN	24/01/24

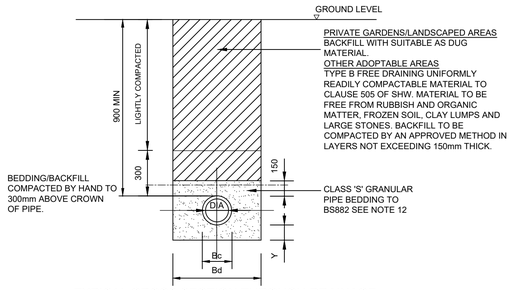
DRAWN BY	CHECKED BY	APPROVED BY
SJB	JG	JG

wardell armstrong



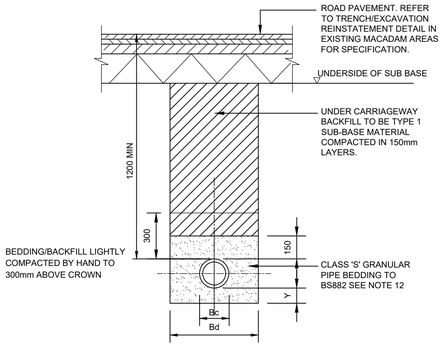
SECTION A-A

N.T.S.



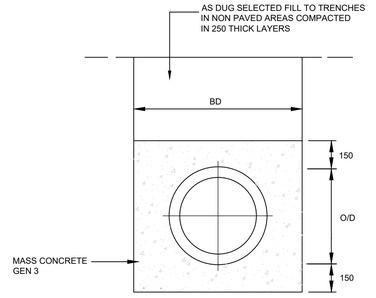
TYPICAL CROSS SECTION THROUGH DRAINAGE TRENCH IN OTHER AREAS

SCALE 1:20



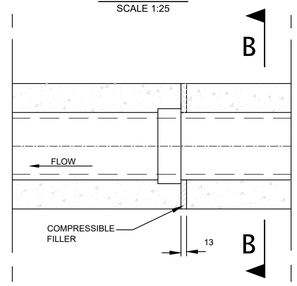
TYPICAL CROSS SECTION THROUGH DRAINAGE TRENCH UNDER CARRIAGEWAY/ADOPTABLE AREAS

SCALE 1:20



SECTION B - B

SCALE 1:25

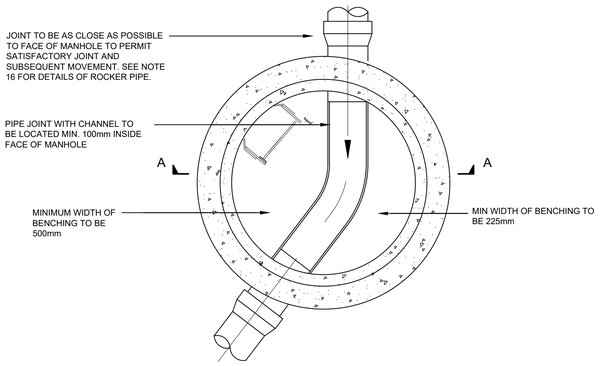


FLEXIBLE JOINT DETAIL

CONCRETE BED AND SURROUND

N.T.S

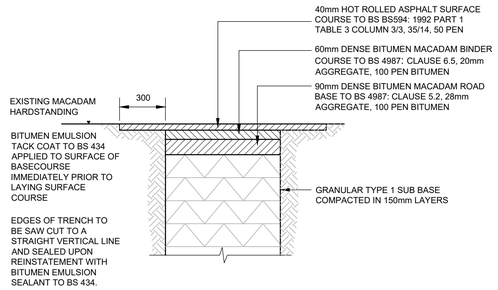
TABLE APPLIES FOR TRENCHES UNDER CARRIAGEWAY AND IN LANDSCAPED AREAS			
PIPE DIA/TYPE	TRENCH WIDTH Bd	APPROX. EXT PIPE DIA Bc	BEDDING THICKNESS Y
150	600	190	100
225	700	280	100
300	850	380	100
450	1150	575	100
525	1200	670	125
600	1350	770	130
900	1900	1100	185



TYPICAL TYPE B MANHOLE - DETAIL

DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 1.45m TO 3m

N.T.S.



TRENCH/EXCAVATION REINSTATEMENT DETAIL IN EXISTING MACADAM AREAS

SCALE 1:20

DO NOT SCALE FROM THIS DRAWING

NOTES

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REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
P0	FIRST ISSUE	26/02/24	LJI	JG	JG

CLIENT

TILLICOULTRY QUARRIES LTD

PROJECT

ELY COATED STONE
NEW PLANT

PRELIMINARY

DRAWING TITLE

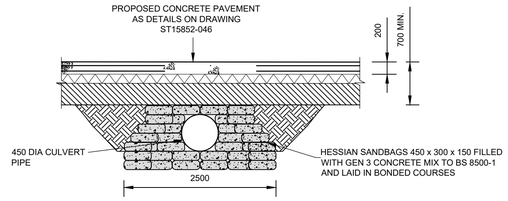
CONSTRUCTION DETAILS
(SHEET 2 OF 4)

DRG No.	REV	SUIT. CODE
NT16548-102	P0	

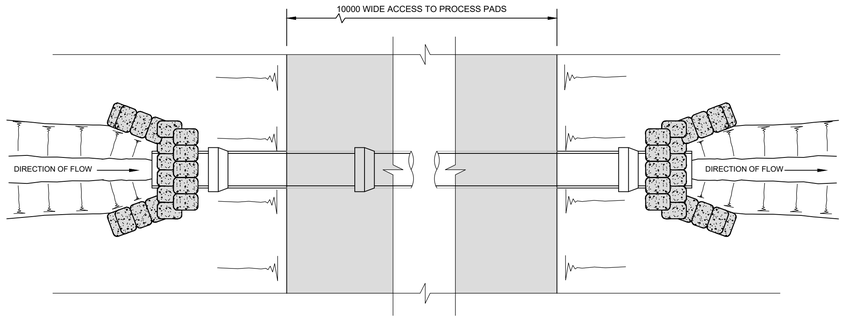
DRG SIZE	SCALE	DATE
A1	AS SHOWN	24/01/24

DRAWN BY	CHECKED BY	APPROVED BY
SJB	JG	JG

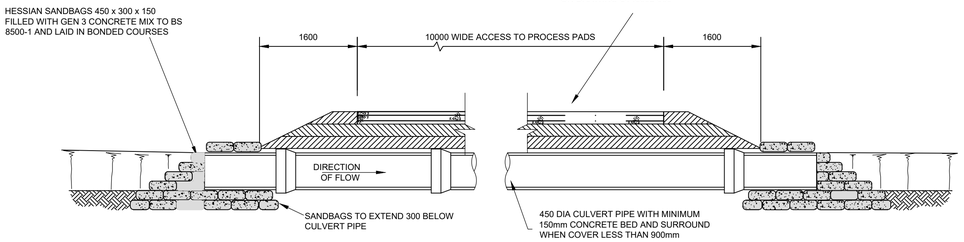
wardell armstrong



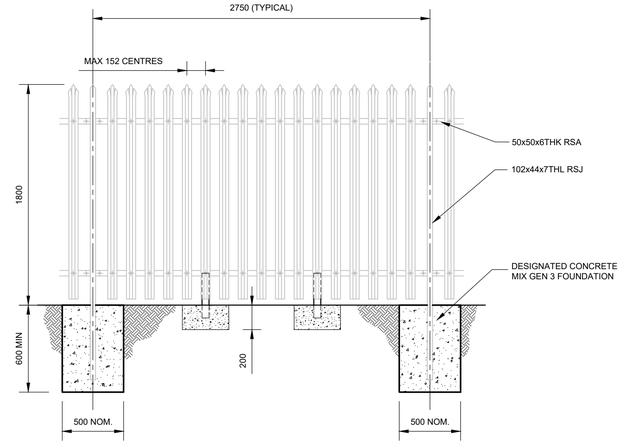
TYPICAL CULVERT END VIEW
SCALE 1:50



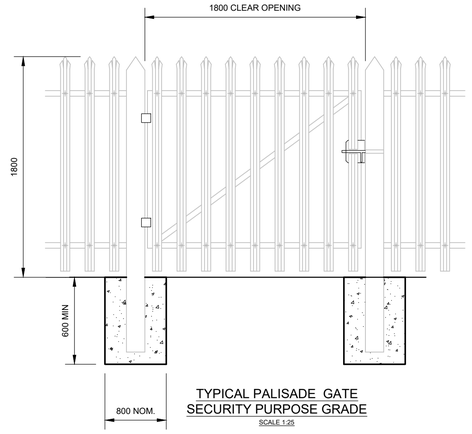
PLAN VIEW
SCALE 1:50



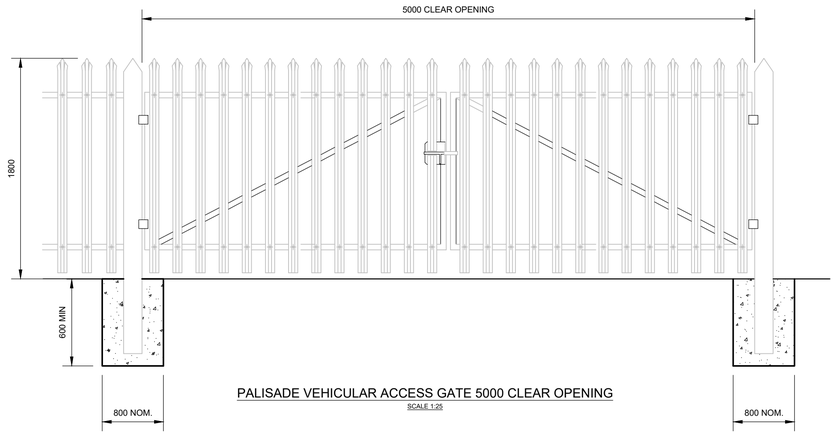
TYPICAL SECTION OF CULVERT CROSSING UNDER
PROPOSED SITE ACCESS
(CULVERT UNDER EXISTING HAUL ROAD SIMILAR)
SCALE 1:50



TYPICAL PALISADE FENCE PANEL
SECURITY PURPOSE GRADE
SCALE 1:25



TYPICAL PALISADE GATE
SECURITY PURPOSE GRADE
SCALE 1:25



PALISADE VEHICULAR ACCESS GATE 5000 CLEAR OPENING
SCALE 1:25

DO NOT SCALE FROM THIS DRAWING

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REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
P0	FIRST ISSUE	28/02/24	LJI	JG	JG

CLIENT
TILLICOULTRY QUARRIES LTD

PROJECT
ELY COATED STONE
NEW PLANT

DRAWING TITLE
CONSTRUCTION DETAILS
(SHEET 3 OF 4)

PRELIMINARY

DRG No.	REV	SUIT. CODE
NT16548-103	P0	

DRG SIZE	SCALE	DATE
A1	AS SHOWN	24/01/24

DRAWN BY	CHECKED BY	APPROVED BY
SJB	JG	JG

wardell armstrong

N:\NT\NT16548 - ELY COATED STONE CONDITIONS\03 - DESIGN\AUTOCAD\NT16548-101-P0_102-P0_103-P0 & 104-P0 CONSTRUCTION DETAILS.DWG

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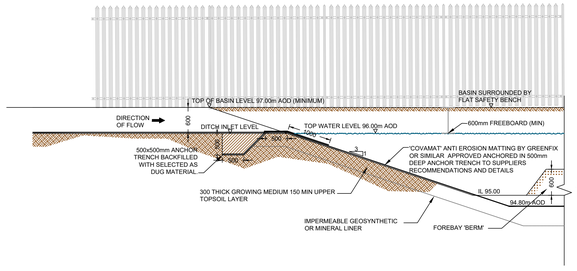
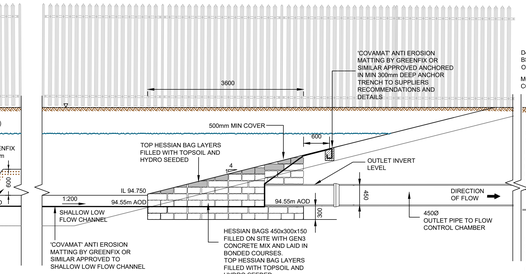
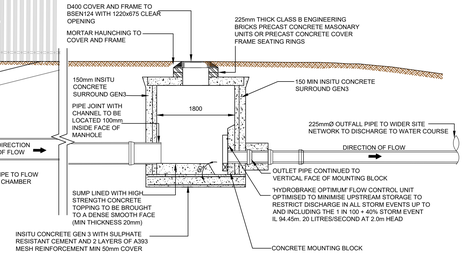


DITCH INLET TO ATTENUATION LAGOON

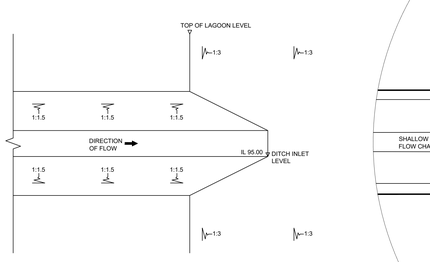


SECTION A-A
SCALE 1:50

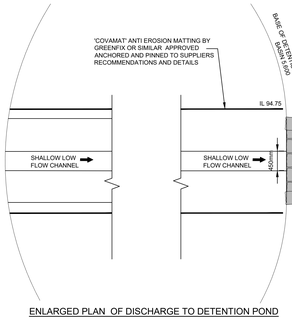
DETENTION BASIN OUTFALL HEADWALL



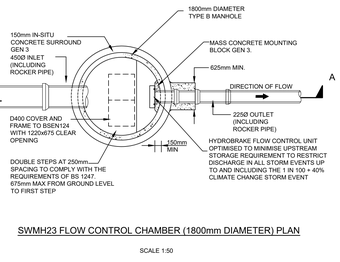
SWMH23 FLOW CONTROL CHAMBER (1800mm DIAMETER)



TYPICAL DITCH INLET TO ATTENUATION LAGOON PLAN
Scale 1:50



ENLARGED PLAN OF DISCHARGE TO DETENTION POND



SWMH23 FLOW CONTROL CHAMBER (1800mm DIAMETER) PLAN

SCALE 1:50

0 1000 5000
SCALE 1:50

0 1000 2500
SCALE 1:25

REV	DETAILS	DATE	DRAWN	CHKD	APPD
P0	FIRST ISSUE	26/01/24	LF	JG	JG

CLIENT: TILLICOULTRY QUARRIES LTD

PROJECT: ELY COATED STONE

PRELIMINARY

DRAWING TITLE: CONSTRUCTION DETAILS (SHEET 4 OF 4)

ORG No.	REV	SUIT. CODE
NT16548-104	P0	

DRG SIZE	SCALE	DATE
A0	AS SHOWN	24/01/24

DRAWN BY	CHECKED BY	APPROVED BY
SJB	JG	JG

wardell armstrong

N:\NT\NT16548-\ELY COATED STONE CONDITIONS\03 - DESIGN\AUTOCAD\NT16548-101(P3_102(P3 & 104(P3 CONSTRUCTION DETAILS.DWG