Future Water MJJV Ltd

Portsmouth Water

Havant Thicket Reservoir

Construction Phase Flood Risk & Drainage Plan

Havant Thicket Reservoir – Dual Pipeline Planning Application (Reservoir Site)

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Contents

1. Introduction **3**

1.1. Scheme Overview 3

General 3

Main reservoir embankment 4

Wetland structure 4

Culvert and outlet pipe 5

1.2. Key details 5

1.3. Key changes from original proposal 8

1.4. Site overview 9

1.5. Study sections 12

2. Flood Risk Management **14**

2.1. Scope requirements 14

2.1.1. Main reservoir embankment 14

2.1.2. Wetlands retaining structure 14

2.1.3. Culvert and pipework 15

2.2. Design criteria 15

2.3. Main reservoir embankment flood design 17

2.3.1. General 17

2.3.2. Fluvial flooding 17

2.3.3. Tidal flooding 18

2.3.4. Surface water flooding 18

2.4. Wetlands flood design 19

3. Drainage Management **21**

3.1. Scope requirements 21

3.2. Construction drainage 22

3.3. Permanent drainage 25

4. Operation and Maintenance **27**

4.1. During Construction 27

4.2. Completed Reservoir 27

4.2.1. Dam safety 27

4.2.2. Main reservoir maintenance 27

4.2.3. Wetlands maintenance 29

Table index

Table 1	Main reservoir key details	5
Table 2	Wetland structure key details	7
Table 3	Key changes from original proposal	8
Table 4	Study sections used for flood risk analysis (HTR-ATK-XX-XX-RP-Z-0042)	12
Table 5	Culvert & Pipework – Functional Requirements	15
Table 6	ICE (2015) Flood, wind and wave protection standards	16
Table 7	Summary of change in fluvial flood risk as a result of the embankment and wetland retaining structure	17
Table 8	Summary of change in surface water flood risk as a result of the embankment and wetland retaining structure	18
Table 9	Main reservoir embankment maintenance tasks	27
Table 10	Culvert and tower maintenance tasks	28
Table 11	Valve and actuator maintenance tasks	28
Table 12	Spillway maintenance tasks	29
Table 13	Wetlands maintenance tasks	29
Table 14	Valve and actuator maintenance tasks	30

Figure index

Figure 1	Plan of main rivers and ordinary watercourses in proximity to HTR (HTR-ATK-XX-XX-RP-Z-0042)	11
Figure 2	Map showing Study Sections (HTR-ATK-XX-XX-RP-Z-0042)	13
Figure 3	Extract of temporary drainage plan (B038779-TTE-00-XX-DR-C-0501) showing location of outlets to divert water through drainage system	23
Figure 4	Extract from HTR-GHD-WC-ZZ-DR-L-0064 showing plan and section of outlet through Compartment 2	24

1. Introduction

1.1. Scheme Overview

General

The proposed Havant Thicket Reservoir (HTR) will be a new reservoir to be built in Havant, which is approximately 10km north of Portsmouth.

The operating capacity of the reservoir is 8,700 ML, including borrow pits but not including water below the lowest draw off level or retained in the wetland. The top water level (TWL) is 39.5 m AOD, and the lowest operating level is 29.0 m AOD. The lowest 20% of the total volume is considered dead storage, i.e. the minimum level before the reservoir operationally fails. General arrangement of the key elements of the design are contained in Appendix 1.

Document Scope

This Construction Phase Flood Risk & Drainage Plan is intended to set out how the scheme is to be carried out in accordance with the submitted flood risk assessment (ref HTR-ATK-XX-XX-RP-Z-0042, titled A15.2 Flood Risk Assessment Report, compiled by Atkins on behalf of Portsmouth Water Ltd dated 01/09/20). The report details the mitigation measures implemented by Future Water during the construction of Phases 2 & 3.

The Construction Phase Flood Risk & Drainage Plan is intended to address the requirements of Condition 32 in relation to phases 2 & 3, as well as summarising the flood risk impact as a result of the proposals for the construction phase of Havant Thicket Reservoir. This report addresses the flood risk concerns detailed in the flood risk assessment (ref HTR-ATK-XX-XX-RP-Z-0042) by providing a summary (Section 2) related to the study sections and confirming there is no increase in flood risk as a result of the proposals.

o A detailed drainage management plan that details the management of drainage associated with phases 2-3 is provided in section 3.0

o Detailed information surrounding the number of permanent structural elements including the proposed dimensions and height of the embankment, associated spillway, control house and wetland retaining structure (including the proposed piped controls) is provided in section 1.2

o Detailed information including the long-term maintenance scheduled for the proposed development is provided in section 4.0

The information provided in this report applies to Phases 2 to 8 of the development. Details of localised drainage systems for future phases 4-8 will be subject to further revision of drainage management plan. Where these elements affect the overall drainage strategy, the information provided with the outline permission flood risk assessment have been assumed.

The elements of Condition 32 related to the location and access to the visitor centre will be addressed separated as part of Phase 9 of the development.

1.2. Key details

Main reservoir embankment

The main reservoir embankment is 2,850 m long with a height of 20 m at an embankment crest level of 40.5 m AOD. This is 1 m above the top water level and therefore the reservoir has 1 m of freeboard as required by the Reservoir Flood Study (HTR-ATK-RZ-RE-RP-Z-0006). The embankment consists of a zoned earthen embankment with the following zones:

- a central, low permeability core as the main water retention zone (Zone 1)
- chimney filter and blanket filter/drain to control seepage through the embankment (Zone 2)
- upstream and downstream shoulders to support the core and maintain stability (Zone 3)

The upstream and downstream shoulders are sloped at 1V:9H where the height of the embankment is greater than 10m (except adjacent to Staunton Country Park where the slopes will vary from 1V:8H to 1V:9H), and 1V:8H where the height of the embankment is less than 10m. The crest is protected with a gravel pavement for vehicle access.

The spillway is at 39.5 m AOD, consisting of a 3 m long weir, with a 700 mm diameter pipe, which gives a 1.3 m^3/s discharge at a head of 0.4 m. The 700 mm diameter pipe will discharge into Riders Lane Stream downstream of the dam toe. The details of the spillway and pipeline were granted full planning permission by the hybrid planning permissions and will be constructed as Phase 7 of the development.

The embankment will have a toe drain around its entire downstream edge, which will collect the surface water run-off from the embankment and channel it into either the Riders Lane Stream or Durrants Stream (to the River Lavant). A small section of the Riders Lane Stream catchment (0.03 km^2) may be diverted out of the catchment and into the Lavant Headwaters by the toe drain. The Lavant Headwaters catchment area is still reduced, however, as the embankment will intercept a proportion of the baseline catchment, reducing the overall area from approximately 0.50 km^2 to 0.38 km^2.

Further detail is provided in Table 1.

Wetland structure

The wetland comprises two embankments, the Wetland Retaining Structure (WRS) and Wetland Retaining Bund (WRB). The WRS encircles three compartments (numbered 2 to 4) that capture the three main streamlines into the reservoir. The WRB extends from the WRS to create Compartment 1. The WRS has a length of approximately 1075 m and the WRB a length of 375 m along the northern shoreline at an average distance 60-80 m away from where the TWL would cover.

This is planned to facilitate wetland habitat development, provide resilience to seasonal reservoir level changes and to ensure viable habitat that meets biodiversity net gain requirements.

The crest level of the WRS and WRB that separates the wetlands from the main reservoir is set at 40.0 m AOD. At TWL (39.5 mAOD) the wetland area will be approximately 10 ha, however at retained water level (38.8 mAOD) it will be approximately 6.2 ha. The retained wetland level is the level at which the retaining structure starts to hold back water within the wetland area as reservoir levels fall.

The water level in the wetland will be actively managed through the provision of piped controls at strategic locations along the retention structure, which connect the retained wetland to the main body of the reservoir at naturally occurring low points in the topography. These outlet structures consist of DN900 conduits in each compartment with a penstock control on the wetlands side to allow the flow of water both ways in operation. Further detail is provided in Table 2.

The wetlands is programmed to be completed before the end of the main reservoir embankment. Flood control during construction is obtained by the maintaining the outlet structures open to pass any inflows and completion of the overbank, rock lined spillways. The flood risk is lower after the construction of

the main reservoir embankment and so the overbank spillways completed for construction are adequate to maintain sufficient flood capacity. Five overbank spillways to the main reservoir exist along the WRS and WRB crest, consisting of a lowering in the crest level to the spillway crest level of 38.8 mAOD. Rock lining is placed on the flow path over the embankment material to prevent erosion from occurring in flood.

Culvert and outlet pipe

A reinforced concrete culvert passes through the embankment that is 5.1 m wide and 3.75 m high internally. The dimensions of the culvert have been designed to allow installation of all the necessary internal pipework and fittings in construction and if required to be replaced in the embankment's operational life. Access to the culvert is through the control building and valve tower.

The culvert includes two pipelines; a DN1400/DN1600 diameter pipeline to provide a common outlet, and drawdown main, plus an independent 300mm diameter scour/compensation main. The outlet pipe consists of a DN1400 opening in the bulkhead at the base of the valve tower and stays as a DN1400 pipe through the main guard valves. The outlet pipe then enlarges to DN1600 through the downstream culvert before reducing to DN1400 at the bi-furcate to the emergency drawdown pipe. The outlet pipe continues as a DN1400 to the interface pit for the main Bedhampton Pipeline, before reducing to a DN1200 on the route to Bedhampton. The DN1400 emergency drawdown pipe is regulated by a submersible valve that releases the flow into an open channel Riders Lane Stream. Further detail is provided in Table 1.

The outlet and scour pipework passes through the embankment in a reinforced concrete culvert that is 5.1 m wide and 3.75 m high internally. The dimensions of the culvert have been designed to allow installation of all the internal pipework and fittings in construction and if required to be replaced in the dam's operational life. Access to the culvert is through the valve tower and control building.

1.3. Key details

A summary of the key features of the main reservoir is given below in Table 1 and the wetland structure in Table 2.

Table 1 Main reservoir key details

Feature	Description
Dam Embankment	
Embankment type:	Zoned earthfill with central core, chimney filter and blanket filter with finger drains
Embankment slopes:	1V:9H upstream / downstream where height greater than 10m (except adjacent to Staunton Country Park where the slopes will vary from 1V:8H to 1V:9H) 1V:8H upstream / downstream where height lower than 10m.
Design Crest Level (DCL)	40.5 mAOD
Embankment height (above D/S Toe):	20.0 m
Build height (above lowest foundation level):	23.0 m (above lowest foundation – estimated)
Embankment length	2850 m
Reservoir	
Top Water Level (TWL)	39.5 mAOD
Minimum Operating Level (MOL)	29.0 mAOD
Lowest level of reservoir	~22.0 mAOD

Feature	Description
Storage at TWL	9000 ML
Operation storage at TWL	7200 ML
Drawdown from FSL to MDL (with no inflow)	133 days
Surface Area (FSL)	105 ha
Catchment Area	2.0 km^2
Spillway	
Location	CH 910 (Approx)
Spillway type	Concrete inlet structure with 3m crest directing flows to ND700 pipe to Riders Lane Stream
Crest level	39.5 mAOD
Spillway pipe length	450 m
Spillway capacity (a head of 0.4 m)	1.3 m3/s
Outlet Works	
Location	CH 1365
Outlet type	Concrete valve tower with upper draw-off located within the upstream shoulder of the embankment. Upstream culvert from upstream toe directing water to middle draw-off at bulkhead in the base of the tower. Downstream culvert to control house at downstream toe of the reservoir.
Valve Tower	8 m internal diameter concrete tower for upper draw-off. Internal access stairs and platforms over full height
Upstream and downstream culvert	Horseshoe / "D" shape concrete, cut and cover type culvert. Internal height 3.75m and base width 5.1m. Design grade of 1% to downstream with drainage chase to collect and transport seepage downstream to Control House.
Draw-off invert levels	High draw-off: 34.0 mAOD Low draw-off: 27.7 mAOD
Outlet pipe size	High draw-off: ND700 mm diameter ductile iron pipe in tower connecting to main ND1400 mm outlet Middle draw-off: ND1400/1600 mm diameter ductile iron pipe to bi-furcation for emergency drawdown and Bedhampton Pipeline Interface. Then ND1200 mm diameter to Bedhampton Pumping Station
Emergency Discharge size	ND 1400 mm to submersible valve in Control House
Guard valves	1 x 700 mm diameter – gate valve 1 x 700 mm diameter – butterfly valve 1 x 1400 mm diameter – gate valve 1 x 1400 mm diameter – butterfly valve
Scour pipe size	ND 300 mm diameter ductile iron pipe from bulkhead to downstream toe of embankment

Table 2 Wetland structure key details

Feature	Description
General	
Wetlands Minimum Operating Level (WMOL) / Spillway Crest Levels	38.8 m AOD
Main Reservoir Top Water Level (TWL)	39.5 m AOD
General	
Wetlands Minimum Operating Level (WMOL) / Spillway Crest Levels	38.8 m AOD
Main Reservoir Top Water Level (TWL)	39.5 m AOD
Design Crest Level (DCL)	40.0 m AOD
Compartments	4
Intercompartment Spillway Crest Level	38.7 mAOD (38.8 mAOD between Compartment ½)
Catchment Area	0.861 km^2
TWL Storage Volume @39.5mAOD	155.0 ML
TWL Storage Area @39.5mAOD	90,034m^2
Compartment 1	
Height (Max.)	2.5 m
Penstock Inlet Invert	37.5 m AOD
WMOL Volume / TWL Volume	7.2 ML / 17.2 ML
TWL Area	12,081m^2
Compartment 2	
Height (Max.)	6.4 m
Penstock Inlet Invert	34.6 m AOD
WMOL Volume / TWL Volume	32.6 ML / 55.7 ML
TWL Area	31,028m^2
Compartment 3	
Height (Max.)	4.9 m
Penstock Inlet Invert	35.1 m AOD
WMOL Volume / TWL Volume	30.6 ML / 49.3 ML
TWL Area	22,323m^2
Compartment 4	
Height (Max.)	4.0 m
Penstock Inlet Invert	36.0 m AOD
WMOL Volume / TWL Volume	15.2 ML / 32.7 ML
TWL Area	24,602m^2

1.4. Key features comparison with original proposal FRA

Table 3 summarises key changes from the outline FRA that have been assessed in this Construction Phase Flood Risk & Drainage Plan.

Table 3 Key feature comparison

Feature	Change	Reason
Main reservoir embankment	Change in embankment alignment	To allow sufficient room at the downstream embankment toe for road and drainage works and not encroach into root protection zone.
	Slope change from 1V:7H / 1V:5H to 1V:9H / 1V:8H	Foundation shear strength reduced due to presence of low strength structure (relict shears)
	Reduction in overall reservoir capacity from 9,200 ML to 8,700 ML.	Flattening of slope as per above resulted in change in reservoir capacity. However, key operational requirement of 8,700 ML is maintained.
	Increase in area of the embankment footprint	Due to flattening of slope
	Change in borrow pit arrangement from three pits to two	Flattening of slope requires an increase in embankment fill material requiring borrow pits to be enlarged.
	Possible removal of bentonite cement cutoff in Bognor Sands formation	To be confirmed, contractor may elect to excavate all Bognor Sands material beneath the embankment and construct a deeper Zone 1 core cut-off into the foundation.
Outlet Works / Valve Tower	Valve tower has moved 35 m upstream away from the edge of the embankment crest	The valve tower penetrated into the embankment core which effectively reduces width of the core increasing the risk of increased seepage and initiation of internal erosion.
Outlet Works / Culvert	ND1200 Inlet/Outlet and ND1400 Emergency Discharge rationalise to single ND1400/ND1600 Multiple Purpose pipe	Twin pipes rationalised to a single pipe as the different operational uses never required at same time. Pipe size increased to ND1600 in downstream culvert to maintain emergency discharge requirements.
	ND1400 removed from upstream culvert	Pipe redundant within culvert and only creates additional maintenance requirements. Removal of pipe requires a concrete intake structure to be added so as water is drawn from the reservoir at the same level as the original pipe intake.
	ND300 scour extended through upstream culvert to reservoir	Removal of ND1400 from upstream culvert and addition of intake structure requires scour to be extended to a new intake directly to the reservoir.
	Downstream culvert internal geometry changed from 6m wide x 4m high to 5.1m wide x 3.75m high.	Minimising size of culvert to reduce potential risk to the dam.

Feature	Change	Reason
	Culvert shape change from rectangular to arched roof	Arched roof is more effective design in regards to concrete volume and minimises potential of differential settlement of the embankment fill adjacent the culvert that can lead to the initiation of internal erosion/"piping" and excessive seepage.
	Overall culvert length increased from 160m to 230m	Flattening of slope has resulted in an increase in culvert length
	Culvert horizontal alignment change.	To allow sufficient room at the downstream embankment toe for pipework to remain out of the root protection zone.
	Culvert vertical alignment change	Base of culvert lowered to level of embankment core cut-off so on more uniform foundation and minimise differential settlement.
Control House	Courtyard length increased from 20m to 50m	To maintain control house dimensions and keep partially buried within embankment, flattened embankment slopes resulted in increased length of courtyard.
Inlet Pipe	New ND800 inlet pipe added from site boundary, following line of overflow spillway (up and over south east embankment corner), running along the bed of the reservoir terminating in the north west of the reservoir.	Added to improve resilience to system and allow inflow and outflow to occur simultaneously when required. Improves mixing of inlet flows in reservoir.
Destratification System	Air pipe running up and over embankment from control room (buried) to res floor (tied down, buoyant pipes) – pipe from control room bifurcates in valve pit near crest of embankment, each pipe run in res terminating in borrow pits	Removes need for high pressure air lines within culvert.
Wetland Embankment	Slope change from 1V:3H / 1V:4H to 1V:5.5H to 1V:10H	Foundation shear strength reduced due to presence of low strength structure (relict shears)
	Manhole with penstock included on wetlands side of crest for water level control	Height off embankments required manhole arrangement for ease of access to operation personnel

1.5. Site overview

Within the study area there are two Environment Agency defined main rivers, the Hermitage Stream and the Riders Lane Stream, as shown on Figure 1.

Main rivers are usually larger rivers and streams, on which, the Environment Agency are responsible for carrying out maintenance and improvement works. Smaller rivers are referred to as Ordinary Watercourses, and the flood risk management of these watercourses is carried out by Lead Local Flood Authorities (LLFAs) and / or District Councils.

The Hermitage Stream has an approximate catchment size of 20 km^2, however 4.5 km^2 of that area is attributed to the Riders Lane Stream catchment. The upper catchment of the Riders Lane Stream

includes five ordinary watercourses, which are intermittent or temporal streams. The Riders Lane Stream also has a pond feature called ‘Upper Lake’ at National Grid Reference (NGR) SU 7142110030.

To the west of the reservoir site are the headwaters of Park Lane Stream (part of the Hermitage Stream catchment). The Park Lane Stream is classed as Ordinary Watercourse until it is culverted under the urban area, where it becomes a main river. The confluence of the Park Lane Stream with the Hermitage Stream is just upstream of the confluence of the Hermitage Stream with the Riders Lane Stream.

Within the reservoir footprint (considered the area within the top water level of the reservoir at the upstream extent and the embankment toe and the downstream extent), towards the eastern edge, there are some small unnamed watercourses. These are mainly ditch-like still-water headwaters that drain eastwards into Durrants Stream to the River Lavant.

The Nominal Tidal Limit (NTL) is at NGR SU 70511 06237 on the Hermitage Stream, just south of Meyrick Road. The Hermitage Stream flows over a weir at this point, after which it becomes a transitional waterbody, Langstone Harbour.

Figure 1 also shows the location of two National River Flow Archive (NRFA) gauges; Hermitage Stream at Havant (NRFA no. 42017) and Lavant Stream at Leigh Park (NRFA no. 42025).

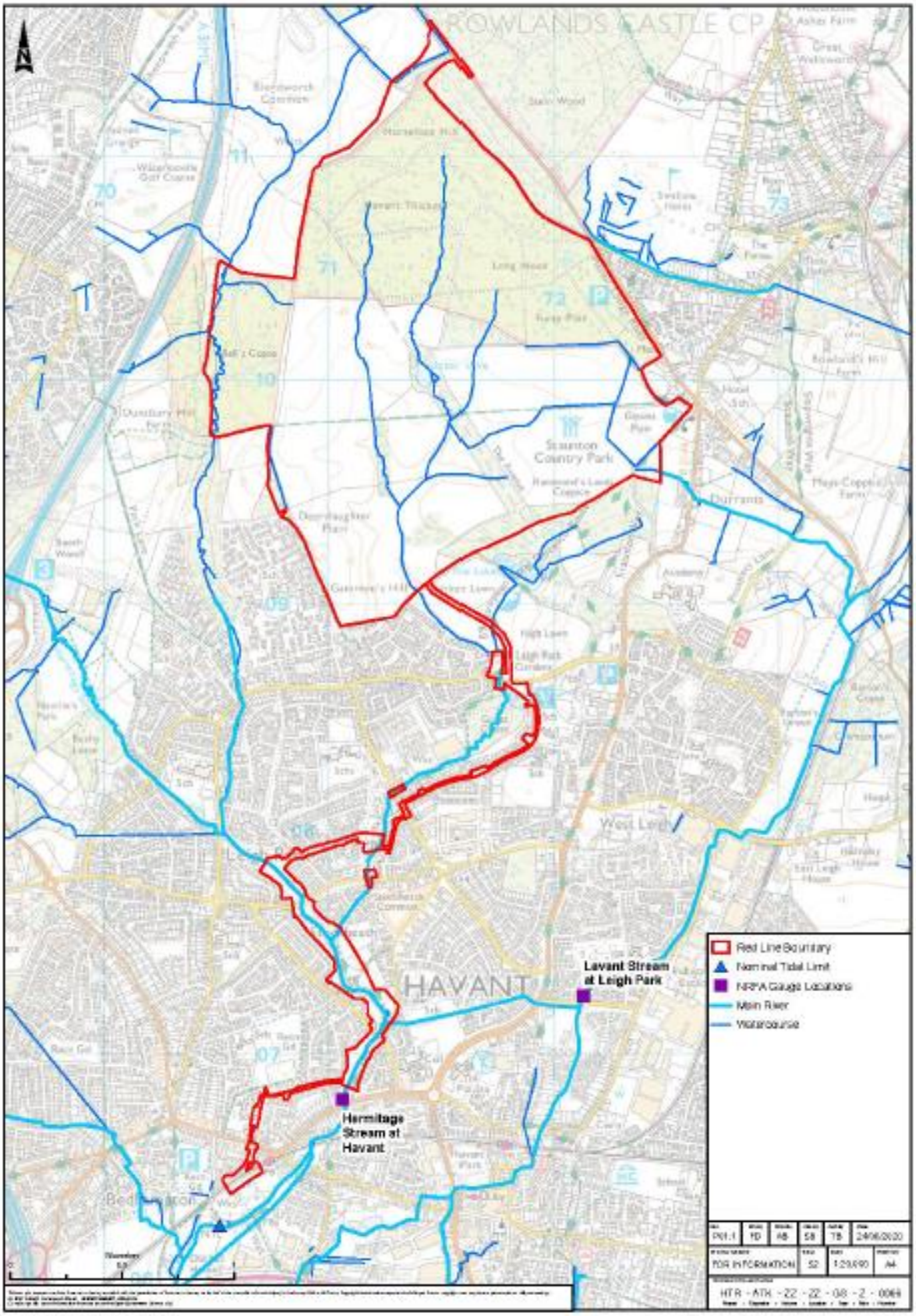


Figure 1 Plan of main rivers and ordinary watercourses in proximity to HTR (HTR-ATK-XX-XX-RP-Z-0042)

1.6. Study sections

The study sections adopted in flood risk analyses completed for the Environmental Statement Volume 4 – Appendix 15.2 Flood Risk Assessment Report (HTR-ATK-XX-XX-RP-Z-0042) are again used for reference. The study sections are described in Table 4 and Figure 2 (reproduced from HTR-ATK-XX-XX-RP-Z-0042).

Table 4 Study sections used for flood risk analysis (HTR-ATK-XX-XX-RP-Z-0042)

Study Section	Description	Grid reference – upstream	Grid reference – downstream
1	Headwater Streams 1, 2 and 3 up to Reservoir footprint	HS1 – SU 71178 10789 HS2 – SU 71520 11000 HS3 – SU 71743 10398	HS1 – SU 71160 10368 HS2 – SU 71421 10346 HS3 – SU 71713 10253
2	Headwater Streams 1, 2, 3, 4, 5, Upper Lake and short section of Riders Lane Stream (RLS) all under Reservoir footprint	HS1 – SU 71160 10368 HS2 – SU 71421 10346 HS3 – SU 71713 10253 HS4 – SU 71828 09793 HS5 – SU 71621 09697 RLS – SU 71314 09436	HS1 – SU 71314 09436 HS2 – SU 71537 09816 HS3 – SU 71537 09816 HS4 – SU 71621 09697 HS5 – SU 71475 09570 RLS – SU 71319 09440
3	RLS between Reservoir footprint up to Hermitage Stream confluence. The Lake Stream (TLS) joining Riders Lane Stream from Leigh Lake.	RLS – SU 71319 09440 TLS – SU 71836 09095	RLS – SU 71007 07503 TLS – SU 71747 08787
4	Hermitage Stream – between A3(M) and confluence with Riders Lane Stream	SU 69631 09096	SU 71007 07503
5	Hermitage Stream – between confluence with Riders Lane Stream and Nominal Tidal Limit (NTL)	SU 71007 07503	SU 70511 06237
6	Langstone Harbour	SU 70511 06237	SU 68652 00138
7	Headwater Streams draining east towards River Lavant	SU 71947 09871	SU 72613 09497
8	Park Lane Stream	SU 70563 10531	SU 70513 09001

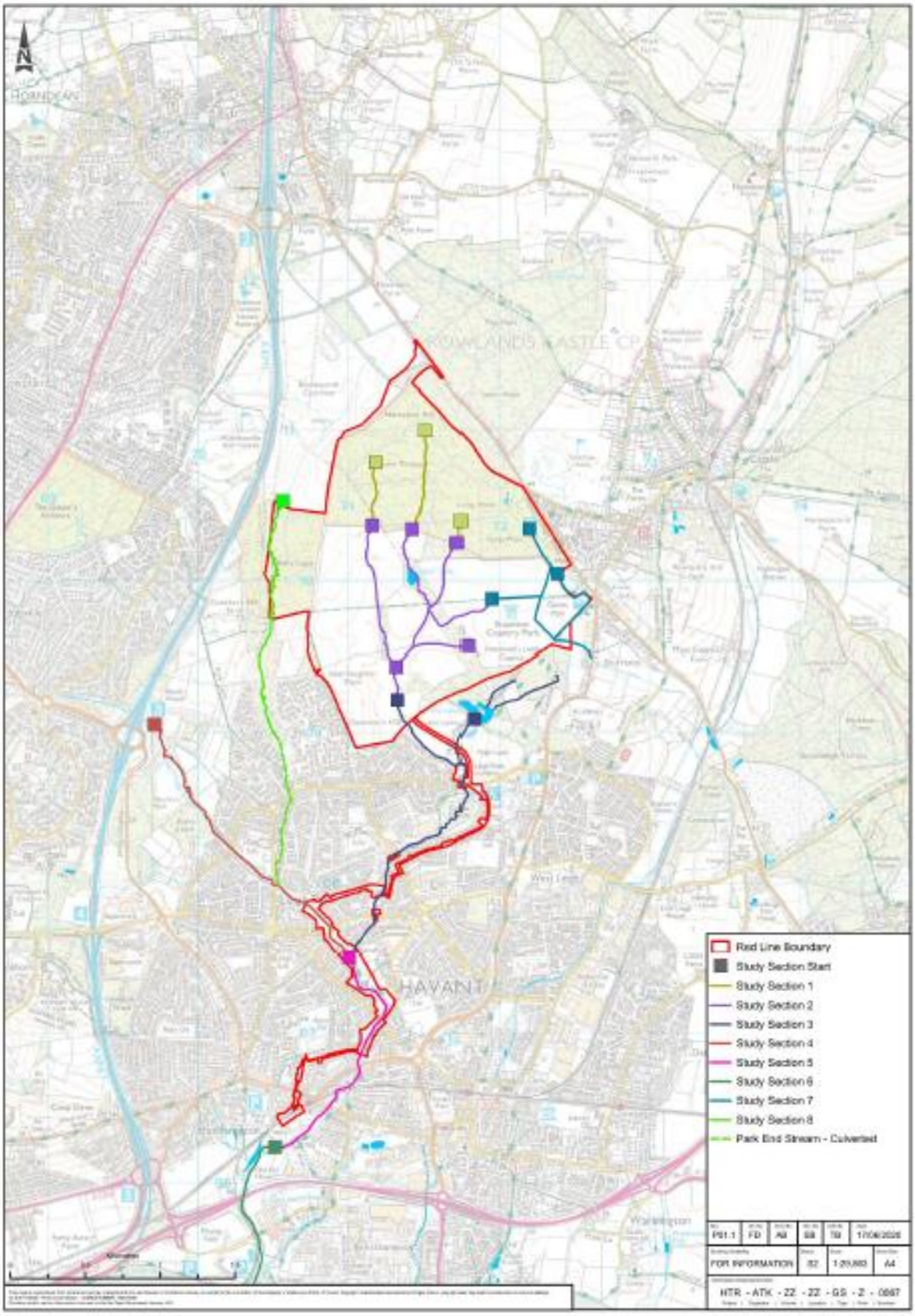


Figure 2 Map showing Study Sections (HTR-ATK-XX-XX-RP-Z-0042)

2. Flood Risk Management

2.1. Scope requirements

2.1.1. Main reservoir embankment

The functional requirements of the main reservoir spillway as outlined in the Scope Support Document (HTR-ATK-RZ-RE-SP-Z-0001) are “to provide sufficient freeboard to contain the reservoir flood rise, prevent overtopping by waves for the Design Flood and include an allowance for long-term settlement (after construction) of the foundation and embankment”. The performance parameters & requirements set out in the outline application, to be met during the detailed design of the spillway are:

- Provision of a spillway weir at the TWL of 39.5m AOD (designed to accommodate future adjustments for settlement) and associated pipework, chambers and structures to pass the Design Flood and Safety Check Flood.
- Spillway weir comprising a drop-box inlet connected to a concrete pipe crossing the embankment crest and running beyond the reservoir embankment mitre/toe to drain into Riders Lane Stream.
- To avoid debris entering the spillway system, a trash screen shall be installed in front of the spillway weir. This screen shall be detailed to allow manual cleaning and be designed in accordance with C786 Culvert, screen and outfall manual (CIRIA, 2019).
- The spillway shall be based on a flood study for the catchment defined by the proposed embankment alignment. The reservoir inflow hydrographs for the Design Flood (10,000 year flood) and Safety Check Flood (Probable Maximum Flood) shall be derived following the methodologies recommended in Floods and Reservoir Safety (ICE, 2015). The reservoir routing to assess the outflows and flood rise shall take into account the attenuation effect provided by the reservoir surface area. The spillway capacity shall be such that the overflow head affords the required flood freeboard.
- The reservoir flood rise for the SCF flood shall be below the top of the clay core of the embankment.
- The maximum reservoir flood rise shall be used in the calculation of the mean overtopping discharges for the DF and SCF.
- The hydraulic design of the spillway shall show that the weir will not become drowned and that the drainage pipe will operate in free flow conditions up to the SCF peak outflow discharge.

2.1.2. Wetlands retaining structure

The wetlands functional requirement is to “allow flood flows from the catchment to be safely conveyed into the reservoir”. The performance parameters & requirements set out in the outline application of the spillway for the wetlands is:

- The wetland shall be designed as a reservoir in its own right, and which is separate to the Havant Thicket reservoir and certified by the Construction Engineer (under the Reservoirs Act 1975), considering the risk and consequence of failure during construction and being designed and constructed to accommodate appropriate design flood and safety check floods with provision made for managing seepage (including surveillance measures) and affecting drawdown in an emergency. The design provided for outline planning permission assumes that once the main reservoir embankment is constructed the wetland shall cease from being a high risk reservoir in its own right and shall form part of the whole reservoir. This philosophy is maintained through detailed design.

Within the performance requirements for the wetlands are also details of the arrangement of the spillways.

2.1.3. Culvert and pipework

The key requirements being met by the design of the culvert and pipework is summarised in Table 5.

Table 5 Culvert & Pipework – Functional Requirements

Element	Parameter	Element Type	Performance Criteria
Reservoir capacity	At least 9,600ML maximum capacity, including borrow pits volume, above low-level outlet up to at Top Water Level (TWL of 39.5m AOD)	Total capacity not including water below lowest draw off level or retained in wetland	To exceed minimum required total capacity of 8,700ML
Supply rate to Farlington DAF (via Bedhampton booster pumps)	25Ml / day	Inlet / outlet pipeline, varying 1.2m to 0.7m diameter	25 Ml / day over the reservoir operational envelope. Flow rate measured at reservoir control house and Bedhampton Pumping Station
Filling rate of the reservoir (via Bedhampton reservoir fill pumps)	40Ml / day	Inlet / outlet pipeline, varying 1.2m to 0.7m diameter	
Embankment	Crest level 40.5m	Cohesive fill, with zoned clay core and outer shoulders, granular chimney filter and drainage element	
Top Water Level (TWL)	39.5m AOD	Overflow level	Freeboard (from TWL to embankment crest) to contain flood rise due to Design Food and wave action and consider long term settlement.
Lowest operating level	29.0m AOD	Top of lowest 20% of storage volume	Lowest 20% to be considered dead storage, minimum level before reservoir operationally fails.
Emergency drawdown facility	Outline planning application design Discharge capacity of 10.9 m^3/s Reservoir can be lowered by 1/3 of water depth in 6 days	Outline planning application: 1.4m dia scour pipe and submerged discharge valve discharging into Riders Lane Stream at control house; 1.2m dia inlet /outlet pipe discharging into the Hermitage Stream 3km	Installed drawdown rate following Environment Agency guidance to be 0.85m in first 24 hours (5% of reservoir depth) Time to lower 1/3 of the water depth.

2.2. Design criteria

Design of the spillways and embankments are required to satisfy ICE (2015). ICE (2015) provides guidance on the design of a dam for flood, wind and waves based on the assessed hazard of the dam to downstream populations. Two approaches are recommended: the standards-based approach and risk-based approach. As a new reservoir, ICE (2015) recommends the dam be designed using both standards-based and risk-based approaches.

The standards-based approach gives guidance on recommended flood, wind and wave conditions for design based on the assessed hazard (consequences) of a dam failure. The ICE (2015) standards are

reproduced in Table 6. ICE (2015) defines two flood conditions for the assessment of the overflow capacity and freeboard; the 'Design Flood' (DF) and 'Safety Check Flood' (SCF). The Design Flood must be discharged under normal conditions with a safety margin provided by an accepted freeboard limit. The Safety Check Flood is defined as the flood beyond which the safety of the dam cannot be assured.

Risk-based assessments quantitatively calculates a probability of failure and determines the acceptability of risk to life based on societal and individual risk criteria (EA, 2013). Where risks are not deemed to be unacceptable, the need for further risk reduction is decided based on the As Low As Reasonably Practicable (ALARP) principal.

Table 6 ICE (2015) Flood, wind and wave protection standards

Dam Category	Potential effect of a dam breach	Initial reservoir condition standard	Safety check flood conditions		Design flood conditions	
			Reservoir flood inflow	Concurrent wind speed for assessing wave overtopping	Reservoir flood inflow	Concurrent wind speed for assessing the freeboard required to contain wave overtopping or min. flood freeboard provision (whichever is greater)
A	Where a breach could endanger lives in a community	Just full (i.e. no spill)	Probable Maximum Flood (PMF)	Mean annual maximum hourly wind speed	10,000-year flood	Mean annual maximum hourly wind speed, with minimum flood freeboard of 0.6m
B	Where a breach could (i) endanger lives not in a community or (ii) could result in extensive damage		10,000-year flood		1000-year flood	Mean annual maximum hourly wind speed, with minimum flood freeboard of 0.6m
C	Where a breach would pose negligible risk to life and cause limited damage		1000-year flood		150-year flood	Mean annual maximum hourly wind speed, with minimum flood freeboard of 0.4m
D	Special cases where no loss of life can be foreseen as a result of a breach and very limited additional flood damage would be caused		150-year flood		150-year flood	Mean annual maximum hourly wind speed, with minimum flood freeboard of 0.3m

2.3. Main reservoir embankment flood design

2.3.1. General

The detailed design of the spillway to provide flood protection to the main embankment will be carried out in line with the full planning permission parameters. To date FUW have reviewed the Reservoir Flood Studies (HTR-ATK-RZ-RE-RP-Z-0006) completed for the outline planning application design and these were found to be generally in accordance with good practice. Failure of the embankment is still considered likely to endanger lives in a community as previously assumed in the outline design. Therefore, no significant changes to the functional requirements of the main reservoir spillway as outlined in Section 2.1.1 are expected. Given this, the impacts of flooding from the other proposed changes to the project as outlined in Section 1.4 are discussed below.

2.3.2. Fluvial flooding

There is no change in the fluvial flood risk detailed in the Environmental Statement Volume 4 – Appendix 15.2 Flood Risk Assessment Report (HTR-ATK-XX-XX-RP-Z-0042). The change in alignment and embankment slope angles has resulted in a minor decrease in the area upstream of the embankment crest to capture rainfall and rainfall run-off into the reservoir. However, the minor changes do not alter the fluvial flood risk as reported in HTR-ATK-XX-XX-RP-Z-0042, reproduced below in Table 7.

Table 7 Summary of change in fluvial flood risk as a result of the embankment and wetland retaining structure

Study Section	Summary of change in fluvial flood risk
1	There is no change in flood risk in Study Section 1 as it is upstream of the reservoir.
2	Post construction, within Study Section 2, the intermittent or temporal streams will be replaced by a wide expanse of stored water. The watercourses in this study area have been replaced with the reservoir. The visitor centre is built within the wetland, and is therefore at risk of flooding resulting in a rise in the water level of the reservoir. The visitor centre is classified as “Less Vulnerable” development, and as such should be designed with a finished floor level above the 1% (1 in 100 year) AP event, plus an allowance for climate change (35% and 45% for the “central” and “higher central” estimates respectively). The 1% (1 in 100 year) AP event gives reservoir peak water levels of 39.65 m AOD and 39.67 m AOD for the “central” and “higher central” estimates. When an allowance for wave height is included (0.1m, due to the limited fetch distance from the wetland retaining structure) and freeboard (0.3 m), the recommended finished floor level for the visitor centre is 40.1 m AOD. The southern access road is within Study Section 2 and crosses into the Park Lane Stream catchment (Study Section 8). The northern access road does not cross into any other waterbody areas. The areas of construction are not within Flood Zone 2 or 3 and therefore neither access road is expected to alter fluvial flood risk.
3	Directly downstream of the reservoir. During a 1% AP flood, there is a reduction in peak flow of 3.64 m^3/s and a reduction in peak level of 0.64 m at the upstream end, and 3.37 m^3/s and 0.15 m at the downstream end. Across the Study Section the flood extent for this event is reduced by 0.03 km^2, which is an 87% reduction. During a 0.1% AP, there is a reduction in peak flow of 5.99 m^3/s and a reduction in peak level of 0.66 m at the upstream end, and 2.82 m^3/s and 0.10 m at the downstream end. Across the Study Section the flood extent for this event is reduced by 0.04 km^2, which is an 82% reduction. There is no predicted change in flood risk to The Lake Stream. A small section of the embankment will drain to the Riders Lane Stream via a toe drain, however, this will not increase fluvial flows compared to baseline levels. The location of the control house is not within Flood Zone 2 or 3 and during normal operation of the reservoir the, will not be at risk of flooding. If the reservoir were to breach, then the Control House would be at risk of flooding. This will be discussed in Section 8.

Study Section	Summary of change in fluvial flood risk
4	The operation of the reservoir and embankment is not predicted to have any impact on fluvial flood risk in Study section 4 as it is upstream of the confluence with the Riders Lane Stream
5	During a 1% AP, there is a reduction in peak flow of 3.50 m³/s and a reduction in peak level of 0.16 m at the upstream node, and 3.20 m³/s and 0.07 m at the downstream node. Between the two nodes the floodplain extent has reduced by 0.01 km², which is a 25% reduction. During a 0.1% AP, there is a reduction in peak flow of 4.48 m³/s and a reduction in peak level of 0.09 m at the upstream node, and 3.87 m³/s and 0.07 m at the downstream node. Between the two nodes the floodplain extent has reduced by 0.01 km², which is a 13% reduction.
6	During a 1% AP, there is a reduction in peak flow of 3.20 m³/s and a reduction in peak level of 0.07 m at the upstream node, and 2.78 m³/s and 0 m at the downstream node. Between the two nodes there is no change in the floodplain extent. During a 0.1% AP, there is a reduction in peak flow of 3.87 m³/s and a reduction in peak level of 0.07 m at the upstream node, and 3.95 m³/s and 0 m at the downstream node. Between the two nodes there is no change in the floodplain extent. The effect of the tidal influence reduces the impact of a reduction in flood level and extent.
7	As discussed in previous sections, the Lavant Headwaters will be intercepted by the new embankment. This reduces the catchment area from 0.50 km2 to 0.31 km2 (38%). This will result in a decrease in flow and level within the Lavant, thereby reducing flood risk. The embankment drains into a toe drain around the southern perimeter, some of which flows into the Lavant. This has been included in the reduction of catchment area calculation and will be discussed further in the surface water section.
8	The southern access road is within Study Section 2 and crosses into the Park Lane Stream catchment (Study Section 8). At this point it is an Ordinary Watercourse. The areas of construction are not within Flood Zones 2 nor 3 and are not expected to alter fluvial flood risk. There is therefore no change expected for the Park Lane Stream.

2.3.3. Tidal flooding

There is no change in the tidal flood risk as detailed in the Flood Risk Assessment Report (HTR-ATK-XX-XX-RP-Z-0042). Therefore, the results as summarised in the Flood Risk Assessment Report (HTR-ATK-XX-XX-RP-Z-0042) below are unchanged:

There is no change in extent between the baseline and with-scheme results under the current climate or with inclusion of climate change. The construction of the scheme therefore does not affect tidal flood risk.

2.3.4. Surface water flooding

The changes in surface water flood risk are described qualitatively in Table 8, referenced to each study section.

Table 8 Summary of change in surface water flood risk as a result of the embankment and wetland retaining structure

Study Section	Surface Water Flooding
1	There is no change in flood risk in the headwater streams upstream of the reservoir. The surface water flow routes will discharge into the existing streams and into the wetland and / or reservoir.
2 & 3	The main embankment captures direct rainfall on the reservoir, from the wetland area and from headwater streams upstream of the wetland / reservoir. There is no surface water flood risk due to the embankment or wetland retaining structure downstream of the reservoir along Riders Lane Stream due to the reduction in peak water levels and flow rates caused by the capture and attenuation of rainfall in the reservoir. The visitor centre will increase the area of hardstanding with a corresponding increase in surface water runoff rates and volumes. Both the southern access road and the northern access road will increase hardstanding. Surface water drainage systems at the toe of the embankment and from

Study Section	Surface Water Flooding
	seepage collections systems within the embankment will be directed back to existing water courses downstream of the embankment. The design of the drainage is to be finalised at the detailed design stage and included in the hard landscaping reserved matters submission. As part of the design, surface water management techniques will be incorporated, for example, Sustainable Drainage Systems (SuDS). SuDS principles will be adopted where possible and the drainage design will follow the local and national guidance and best practice documents. The design criteria and agreement with stakeholders will be detailed in the Drainage Management Plan to be completed as part of these works. It is assumed that the net increase from the reservoir site will not increase surface water runoff and downstream flood risk.
4	There are no changes in surface water flood risk in the Hermitage Stream section from the A3(M) and the confluence of Riders Lane Stream.
5	There is no predicted change in surface water flow routes as a result of the reservoir. Localised surface water flood risk, however, is likely to reduce due to the reduction in peak levels and flow within the watercourse providing more capacity for the surface water network to discharge into the channel.
6	There is no predicted change in surface water flow routes as a result of the reservoir. The tidal influence in this section reduces the benefit of reduced flows and levels in the channel having a beneficial effect on the discharge of urban surface water.
7	As discussed in relation to fluvial risk, the Lavant Headwaters catchment is reduced by 38%. This calculation includes the surface water drainage from the embankment which is routed into the toe drain and into the River Lavant. There is therefore a reduction in surface water flood risk for Study Section 7.
8	No significant impacts assumed, to be revised in Drainage Management Plan to be completed as part of these works.

2.4. Wetlands flood design

Details of the spillway geometry are given in the scope requirements. These requirements have been met in the detailed design. However, a check of these designs to ensure they meet the requirements of ICE (2015) was also completed.

As the wetlands embankment is proposed to be constructed prior to the main embankment, two scenarios were reviewed:

- Temporary: Prior to completion of the main embankment where an uncontrolled dam breach will impact construction workers and proceed downstream into Riders Lane Stream.
- Permanent: An uncontrolled dam breach will flow directly into the main reservoir body.

Based on the calculated outflow from the wetland embankment, it is likely that the downstream population would be affected during construction if a breach was to occur when the wetlands were full and before the main reservoir embankment is high enough to trap the released water. A consequence assessment was not completed to determine quantitatively the number of people or infrastructure affected from such a breach, so conservatively it has been assumed that the wetlands embankment is required to pass the PMF event during construction.

After the main embankment is completed, the risk to the main embankment and the public is insignificant as a breach of the wetlands will result in a marginal rise in the main reservoir. The spillway was therefore judged required to meet the requirements of Dam Category D as per ICE (2015) in normal operation. However, the spillways have been designed to pass the 1 in 1000-year flood.

To pass the probable maximum flood (PMF) event in construction, the sequencing of the wetlands will include openings in the embankment such that flows from events greater than a 1 in 30-year event will be able to pass through the structure. The openings would not allow the wetlands to fill to a depth of more than 300mm over the permanent spillway crest level (39.1m AOD), which is consistent with the

design in normal operation of a 1 in 1000-year event reaching a maximum 300mm depth of water over the spillways with the opening closed.

3. Drainage Management

3.1. Scope requirements

The Contractor's design responsibility for surface drainage through construction requires the following:

305.7.q.v. temporary diversion works to manage surface water inflows into the reservoir during construction, up to the 1 in 30 year return period flood,

FUW is also required to meet the conditions of the Register of Environmental Actions and Commitments (REAC), which is also contained in Appendix A of the Scope Support Document (HTR-ATK-RZ-RE-SP-Z-0001). A REAC condition also requires that "Flows from the construction site should not increase flood risk or cause watercourse scouring. Up to 1:30 rainfall scenario will be attenuated."

The REAC also requires the Contractor to develop a Drainage Management Plan that includes the following detail as a minimum on the drainage design and management:

- Design standards – any areas of surface or foul water drainage affected by the works should be identified and each section of affected drainage should be briefly described, and a proposed solution provided.
- Pollution control/interception – any interceptor solutions should be identified on discipline specific drawings and reviewed during the relevant design stages. For example, any new car parks and associated access roads or haulage routes will incorporate treatment and are transferred to site drainage system.
- Outfalls – known outfalls should be identified and where possible any drainage should tie in with the existing outfalls. Where no existing drainage outfalls are present/known, SuDS principles should be considered to ensure that the discharge rate and volume is suitable. The designing of new drainage catchments should include consideration of any potential attenuation sites. High-level drainage catchment assessments should be undertaken to determine the potential attenuation requirements. It is assumed that drainage scenarios which replicate the current un-attenuated drainage system will remain with no requirement to provide additional water storage.
- Earthworks – a review of existing earthworks and drainage provision should be undertaken to assess the required interventions to be developed at subsequent design stages. Areas are to be identified which currently do not have any drainage but is required.
- Access Roads and Haulage Routes –the development of drainage from the access roads and haulage routes including the modification/re-alignment, connection into or new access road / haulage road infrastructure will be included. Construction mitigation is likely to include but not be limited to measures within the PPGs, e.g., to attenuate and treat polluted runoff. Haul roads will be unpaved and covered in hard core or gravel. Surface water run-off will be collected and treated prior to discharge.
- Third Party Land – drainage interventions to support the reservoir may affect third party land. Assessment of drainage interventions should account for the following scenarios but not limited to:
  - third party land drainage which currently affects the infrastructure;
  - drainage interventions required for the Scheme which may affect third party land; and,
  - outfall required for drainage which is located within third party land.
- Stakeholder engagement and consultation should be undertaken at subsequent design stages when required drainage proposals are further defined. Continued stakeholder engagement will be necessary to obtain consents.

- Surface Water Drains – With particular relevance for the pipeline corridor, detail on the surface water networks in the vicinity of the pipeline construction areas which may transfer pollutants to the nearby river.
- Ecology – Key ecological features to be considered as part of the construction work, including where EcoW may be required.

3.2. Construction drainage

The wetland retaining structure will be constructed in the first phase of construction immediately prior or at the same time as the start of the main embankment construction. Construction of the wetland will require the outlets to be constructed adjacent but isolated from the natural stream course at the stream bed level or a diversion channel to be dug while they are constructed. On completion of the outlet, the natural channel will be diverted through the outlet and then released back into the natural channel downstream of the new embankment. This will allow the wetland embankments to be constructed and the natural flow maintained.

Immediately downstream of the wetland embankments a temporary drainage system has been installed in accordance with the approved Ordinary Water Course Consents (OWC) application, refer to Appendix 2 for the OWC application and Appendix 3 for the OWC decision notice. The temporary drainage system will control the outflow from the wetlands retaining structure through the main reservoir construction area to Riders Lane Stream. The temporary drainage system has been designed to pass up to a 1 in 30 year return period flood as required by the scope and described in Section 3.1. Figure 3 shows the location of the outlets in the wetlands and how they maintain the flow in the natural channel until it is diverted by the temporary drainage system. Details of the outlets in the wetlands retaining structure are shown in Figure 4.

The penstocks in the wetlands structure will remain open through the construction of the main reservoir embankment to allow inflows to pass through and be captured in the temporary drainage system in the works area. As the wetlands reservoir is not large, only minor attenuation is expected of any floods through this structure, however the fluvial flood risk downstream of the wetlands as described in Section 2.3.2 will still be marginally lower after its construction. As described in Section 2.4, the outlets have been designed to pass the PMF, which is far in excess of the 1 in 30 year return period flood requirement. As the construction progresses, any overflow from the wetlands will begin to be captured in the borrow areas within the reservoir area that are the source of embankment fill material. These borrow areas will gain substantial volume to store flood waters with time and help attenuate any flood flows.

In a 1 in 30 year event, with all penstocks remaining open, the entrapped water in the wetlands compartments reaches peak levels of around 1.5m. If a dam breach was to occur at this peak level at the deepest section (in compartment 2), the maximum discharge leaving this locationis 1.26m^3/s (conveyed in the breach opening). The total peak flow downstream of the wetland structure remains much less than the Riders Lane Stream capacity and does not threaten permanent residences.

The wetlands structure will be finished at least two years prior to the completion of the main reservoir embankment. The first stage of the main reservoir embankment construction is to complete the reinforced concrete outlet culvert and valve tower base away from the natural streamlines and temporary drainage channels. On completion of the outlet culvert and tower base, flow along Riders Lane Stream will be blocked by the main embankment construction. Flow in the temporary drainage system within the reservoir area for events greater than 1 in 30 year will then be diverted through the outlet culvert and downstream discharge channel back to Riders Lane Stream. The equivalent 5.1 m internal diameter culvert has a discharge capacity far in excess of that required to pass a PMF flood in construction. The size of the culvert will also provide a minor attenuation of any floods through this structure, therefore lowering the fluvial flood risk downstream of the main reservoir embankment marginally.

On completion of the main reservoir embankment and spillway, a permanent reinforced concrete bulkhead will be constructed immediately upstream of the valve tower in the culvert to block flows down the culvert and commence impoundment of the reservoir for normal operation.

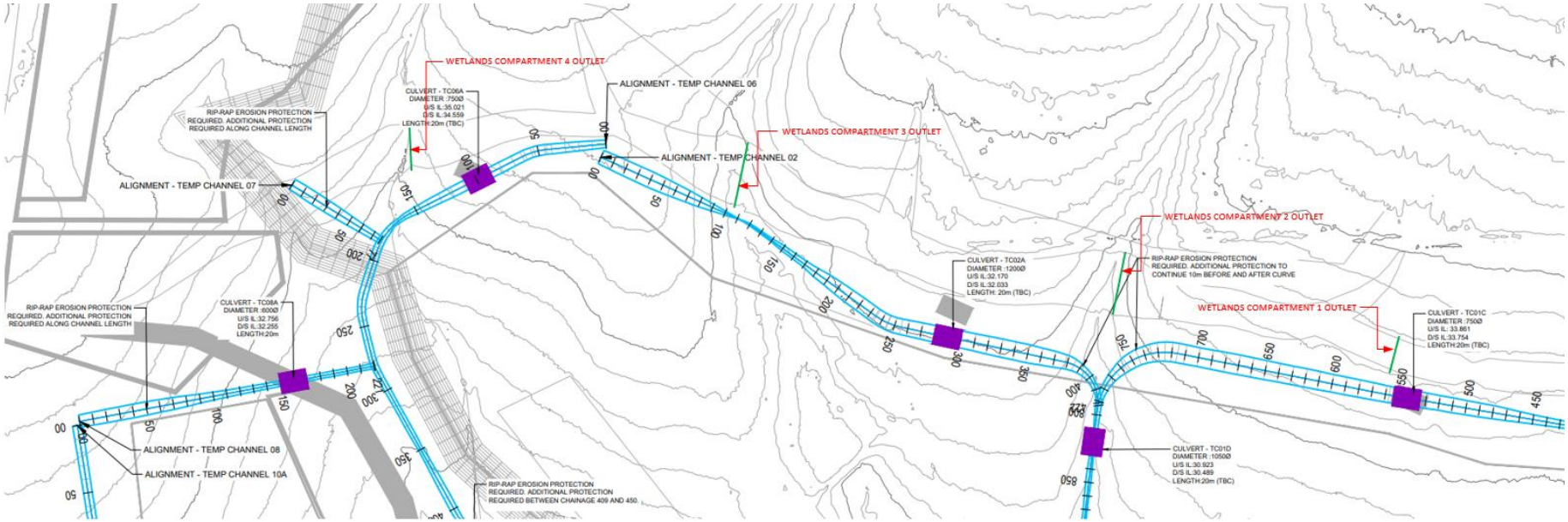


Figure 3 Extract of temporary drainage plan (B038779-TTE-00-XX-DR-C-0501) showing location of outlets to divert water through drainage system

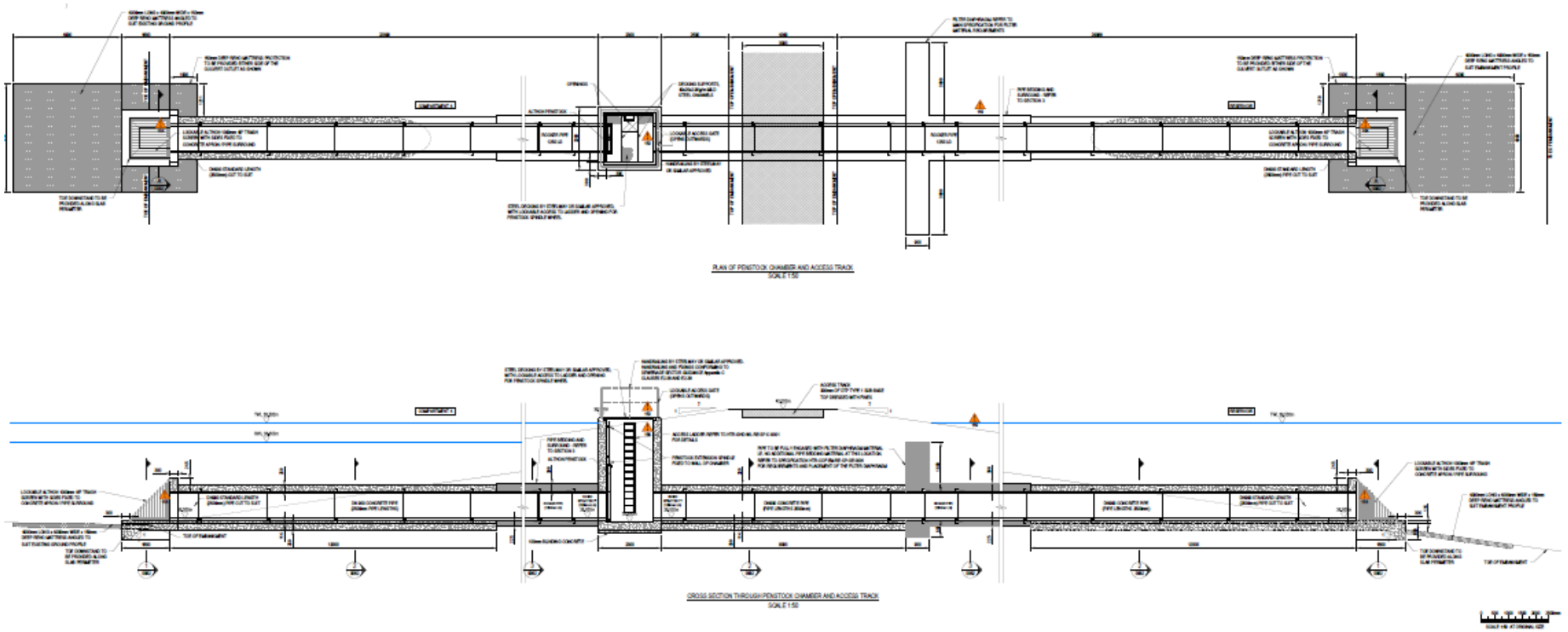


Figure 4 Extract from HTR-GHD-WC-ZZ-DR-L-0064 showing plan and section of outlet through Compartment 2

3.3. Permanent drainage

A Drainage Management Plan is being prepared for the scheme prior to the submission of reserved matters for hard landscaping (Phase 8) as required by the REAC, refer to Section 3.1.

This will include details on the permanent drainage system around the reservoir such as design standards, pollution control/interception, outfall locations, access roads and surface water drains. It will also include details of how increased surface water runoff from new areas of hardstanding (i.e. access roads, visitor centre, car parks etc) and areas of steeply sloped grass (i.e. embankment) will be managed to ensure no increase in flood risk.

The principle for the permanent drainage is to collect runoff from the embankment, paved tracks and surfaces, and convey them south towards the outlet at Riders Lane Stream or Durrants Stream. Without the use of attenuation measures, the runoff from hard surfaces and steep slopes could result in an overall increase in peak flows downstream. To manage these potential increases, measures such as filter drains, which provide both attenuation volume and treatment of surface water runoff, will be used to collect and convey flows downstream. Excess flow will be attenuated in further SuDS features, such as an open pond or basin, which also provides further opportunities for water quality improvements prior to discharging to the watercourse.

The total discharge rate to Riders Lane Stream and Durrants Stream from the drainage systems will be limited to the equivalent greenfield Qbar rate. For the outlet to Riders Lane Stream, this will include an allowance for the compensation flow from the main reservoir.

The LLFA were consulted (October 2023) about the design requirements of the drainage for the reservoir embankment and new hard standing areas. It was agreed in principle that:

- Discharge of surface water runoff will be restricted to the equivalent Qbar rate for all storm events up to and including the 1% AEP rainfall event, plus a 45% uplift for climate change.
- The outfall location will be downstream of the embankment. The primary outfall will be to Riders Lane Stream, but a second outfall to Durrants Stream will also be used for the equivalent area of the site already draining to this watercourse.
- Default runoff co-efficients (Cv values) typically used within the industry standard software for drainage design, is not appropriate for modelling runoff from the reservoir embankment given its slope angle and material composition. For these areas, a Cv value of 0.4 will be used. Elsewhere, flat grassed areas will have a Cv value of 0.3, whereas generally flat gravel tracks and tarmac roads will have values of 0.8 and 0.9 respectively.
- Rainfall data will be based on the FSR data included in the Innovyze InfoDrainage software based on the location of the outfall.
- Water quality will be considered, and evidence provided, that sufficient water treatment has been achieved in accordance with the methodology in the CIRIA SuDS Manual, using the Simple index Criteria (Box 26.2).

The LLFA also requested that consideration be given for those rainfall events in excess of the design criteria. For these scenarios, the drainage design for the scheme will need to make allowances for excess flows to be directed safely to suitable points of discharge, or stored locally until such time the drainage system can covey them, without overflowing to new locations.

Elsewhere, away from the main embankment and associated infrastructure, no new formal drainage is anticipated. Existing access tracks, like the Forestry England route to the north of the wetlands, will continue to discharge via the network of ditches and drains currently serving it. Where required, these will be locally altered to suit any interface issues with the wetland infrastructure, but no further networks are currently required. This will discharge to the wetland and then on to the main reservoir, and so no additional conveyance or attenuation features will be required. The wetlands embankments will also not

require any dedicated drainage network, and so runoff will discharge informally to the wetland or the main reservoir to be attenuated within those structures.

The permanent drainage design for the reservoir site is currently being developed in line with the agreements already in place with the LLFA. The drainage design will follow the best practice principles set out in The SuDS Manual (CIRIA C753, 2015) and guidance from Hampshire County Council Surface Water Checklist Guidance, where relevant.

4. Operation and Maintenance

4.1. During Construction

Maintenance requirements for the temporary drainage system is outlined in the Ordinary Water Course Consents (OWC) application, refer to Appendix 2.

4.2. Completed Reservoir

4.2.1. Dam safety

Havant Thicket reservoir will be regulated under the Reservoirs Act 1975 as amended by the Flood and Water Management Act 2010, which was set to promote the safety of large reservoirs.

As required by the legislation, the reservoir is being designed and will be constructed under the supervision of an All Reservoirs Panel Engineer (as the Construction Engineer) and during operation a Supervising Engineer will do regular visits (twice a year typically) and prepare an annual statement. An Inspection Engineer will inspect the reservoir at least every 10 years, or when requested by the Supervising Engineer. Following the inspection, the Inspection Engineer in his report can identify "measures in the interests of safety" which must be addressed by Portsmouth Water.

Testing of the emergency discharge valves will be undertaken twice per year, in line with the requirements of the Reservoirs Act (1975), and the Environment Agency Guidance for Drawdown Capacity (Environment Agency, 2017). The configuration of the control and submerged valves permits testing of each under full head, without a discharge at design capacity. This regular maintenance and testing is required to ensure the continued safe operation of the reservoir and Emergency Drawdown Strategy.

Full testing of the 'emergency drawdown' system, up to the capacity of the watercourses, will be tested on commissioning of the reservoir.

4.2.2. Main reservoir maintenance

The following tables list some of the recurring maintenance tasks that are to be completed at the main reservoir on completion.

Table 9 Main reservoir embankment maintenance tasks

Task No.	Basic Task	Key Points	Freq.
1	Remove debris and vegetation from upstream face.		1 month
2	Maintain surface drains to ensure free flow of water.		1 month
3	Cut grass and strimming of embankment slopes	Maintain low grass height to aid visual inspection of the embankment for seepage, movement etc.	As needed
4	Clear all trees and non-ornamental shrubs from the embankment.	This protects the embankment from invasive roots that may threaten the dam safety.	6 months
5	Repair to erosion areas.	Remove loose materials and replace with compacted fill. Replace surface material (gravel, rock or grass) to prevent further erosion.	6 months

Task No.	Basic Task	Key Points	Freq.
		If required provide diversion drains around eroded area to prevent future erosion.	
6	Maintain upstream slope protection.	Repair beaching of riprap by re-grading the slope to the original lines and replacing bedding material and riprap. Repair voids in the riprap by adding or moving riprap.	1 year
7	Maintain crest and berm roads.	The crest should be kept well gravelled and graded at the designed crossfall so that it drains properly. The crest should be kept clear of vegetation.	1 year
8	Maintain guard rails and fencing	Replace all damaged sections	As needed

Table 10 Culvert and tower maintenance tasks

Task No.	Basic Task	Key Points	Freq.
1	Clean outlet culvert, including: Pipework Valves Drains	Hose down tunnel floor to remove silt and sludge build up. Remove any rubbish.	1 month
2	Remove buildup and deposits from concrete surfaces.		1 month
3	Remove mineral deposits from metal pipework and protect from seepage.	Divert seepage to drain or loosely cover metalwork.	1 month
4	Remove mineral deposits from electrical equipment (culvert lights and cables) and protect from seepage.	Divert seepage to drain or loosely cover metalwork.	1 month
5	Repair concrete surfaces and joints.	Note: Record and report all problems before making repair as they may be an indication of a serious safety problem.	As needed
6	Clean High Level Intake Screen	Clean more frequently when required.	3 month
7	Clean Low Level Intake Screen	Clean if reduction in water quality associated with this draw off. Requires reservoir drawdown and/or use of divers.	As needed

Table 11 Valve and actuator maintenance tasks

Task No.	Basic Task	Key Points	Freq.
1	Exercise valves	Operate through full travel with dam off line and balanced heads where possible.	6 month
2	Mechanical service of valves		1 year

Table 12 Spillway maintenance tasks

Task No.	Basic Task	Key Points	Freq.
1	Remove obstructions from spillway.	For example large rocks, debris, vegetation, etc.	1 month
2	Remove obstructions within the discharge channel.		1 month
3	Keep concrete joints and surfaces free of vegetation.		6 months
4	Repair concrete surfaces and joints.	Note: Record and report all problems before making repair as they may be an indication of a serious safety problem.	As needed

4.2.3. Wetlands maintenance

The following tables list some of the recurring maintenance tasks that are to be completed at the wetlands structure on completion.

Table 13 Wetlands maintenance tasks

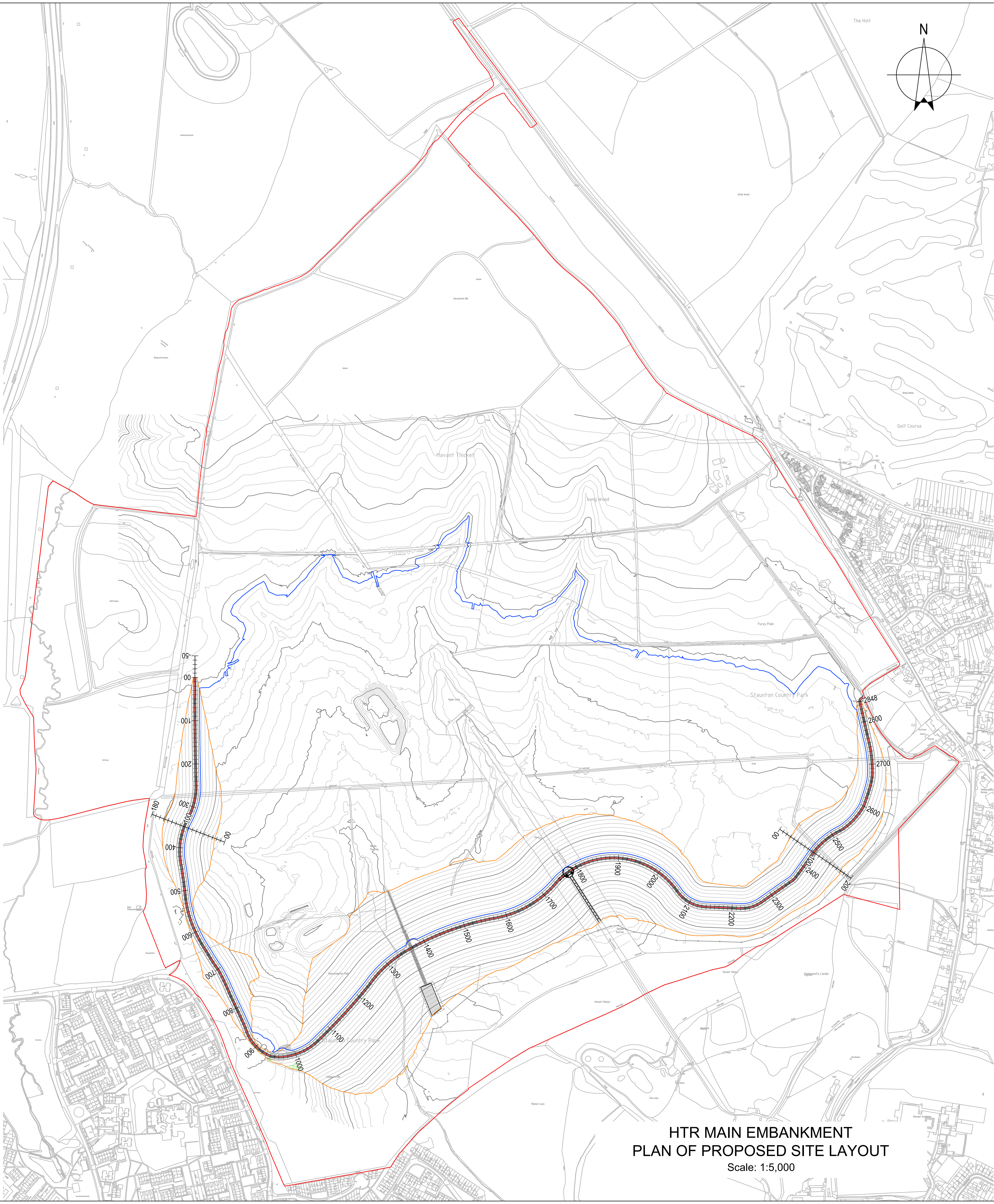
Task No.	Basic Task	Key Points	Freq.
1	Clean intake screens and obstructions on spillways	Clean more frequently when required.	3 months
2	Clear all invasive trees and non-ornamental shrubs from the embankment.	This protects the embankment from invasive roots that may threaten the dam safety.	6 months
3	Repair to erosion areas.	Remove loose materials and replace with compacted fill. Replace surface material (gravel, rock or grass) to prevent further erosion. If required provide diversion drains around eroded area to prevent future erosion.	6 months
4	Maintain outlet pipe and spillway rock protection.	Repair beaching of riprap by re-grading the slope to the original lines and replacing bedding material and riprap where required. Repair voids in the riprap by adding or moving riprap.	1 year
5	Maintain crest road.	The crest access should be kept well gravelled and graded at the designed crossfall so that it drains properly. The crest road should be kept clear of vegetation.	1 year
6	Inspection of internal pipework	CCTV inspection between chambers	5 years
7	Maintain fencing and signage	Replace all damaged or lost sections	As needed

Table 14 Valve and actuator maintenance tasks

Task No.	Basic Task	Key Points	Freq.
1	Exercise valves	Operate through full travel with dam off line and balanced heads where possible.	6 month
2	Mechanical service of valves		1 year

Appendices

Appendix 1 General Arrangement Drawings



HTR MAIN EMBANKMENT
PLAN OF PROPOSED SITE LAYOUT
Scale: 1:5,000

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

NOTES:

1. ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE RELATIVE TO ORDNANCE DATUM.
3. ALL GREYED OUT PROPOSED COMPONENTS TO BE CONFIRMED IN FUTURE PLANNING PHASES.

LEGEND

- MAIN EMBANKMENT DAM
- RESERVOIR AT TOP WATER LEVEL (39.5mAOD)
- EXTENT OF BORROW PITS
- MAJOR CONTOUR (5.0m)
- MINOR CONTOUR (1.0m)
- HTR PLANNING APPLICATION BOUNDARY

Rev	Description	Checked	Approved	Date

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Future Water MJJV Ltd

coffey A TETRA TECH COMPANY

Project No. 03586AC

Client PORTSMOUTH WATER

Project HAVANT THICKET RESERVOIR

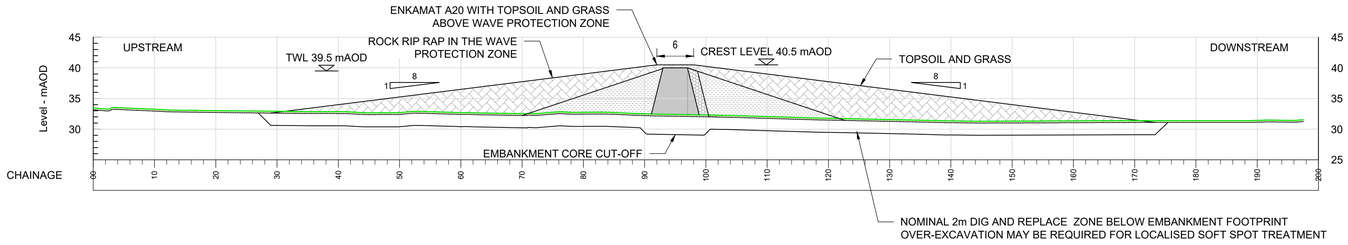
Status PLANNING APPLICATION Status Code S4

Drawing Title MAIN EMBANKMENT PROPOSED SITE LAYOUT

Size A1

Drawing No. HTR-COF-EM-RE-DR-GE-4002 Rev P01

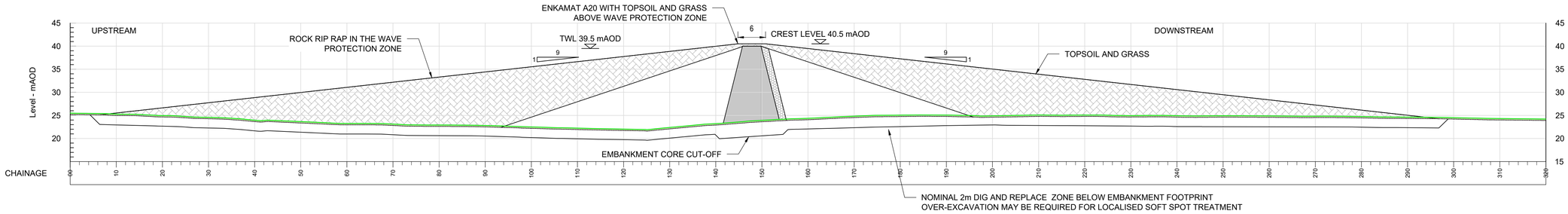
DAM CROSS SECTION AT CHAINAGE 2450



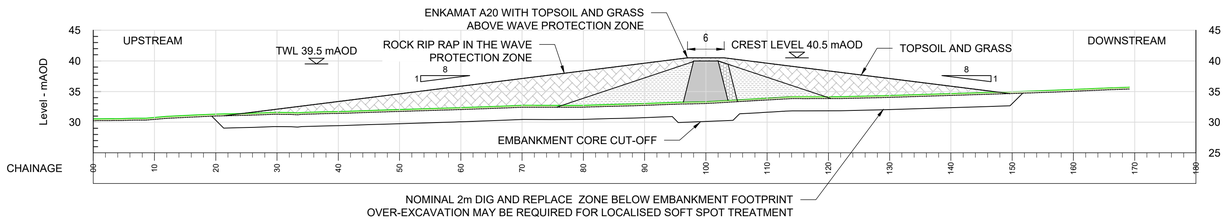
SECTION LEGEND

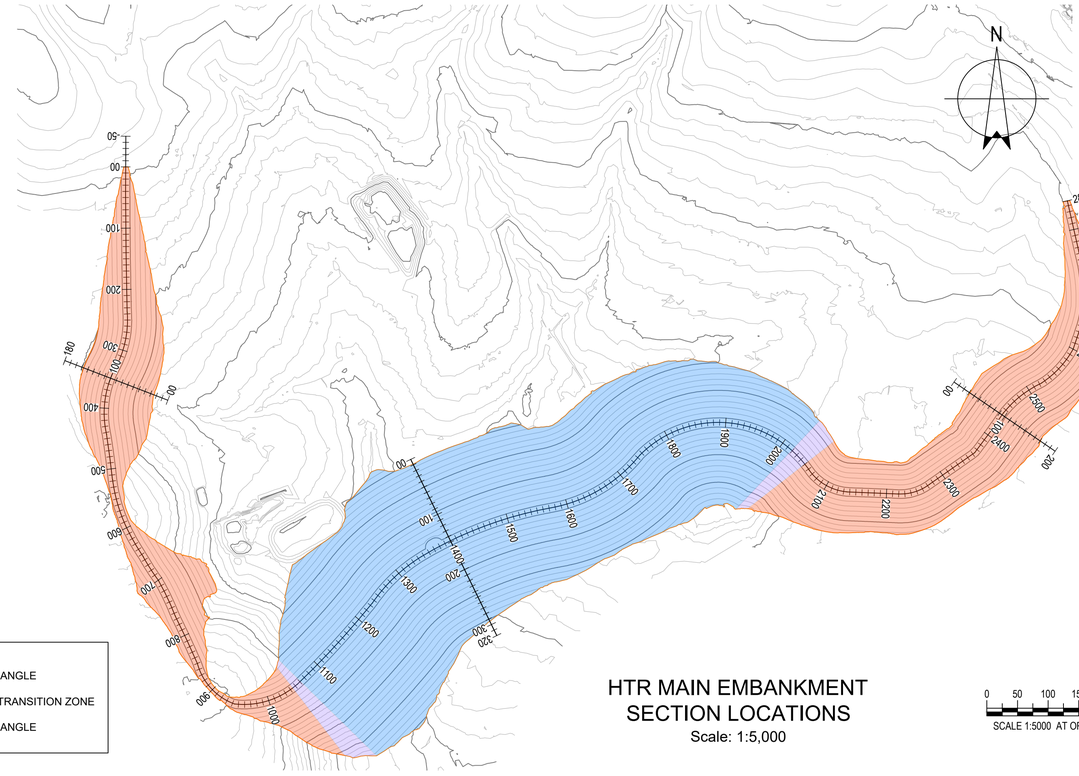
- MAIN EMBANKMENT, OUTER SURFACE (ZONE 3B & 3C)
- MAIN EMBANKMENT, OUTER CORE (ZONE 3A)
- MAIN EMBANKMENT, INNER CORE (ZONE 1)
- MAIN EMBANKMENT, CHIMNEY DRAIN (ZONE 2)
- TOPOGRAPHICAL SURFACE
- TOPSOIL STRIP (TOPO -300mm)

DAM CROSS SECTION AT CHAINAGE 1400



DAM CROSS SECTION AT CHAINAGE 350





HTR MAIN EMBANKMENT
SECTION LOCATIONS
Scale: 1:5,000

0 50 100 150 200 250m
SCALE 1:5000 AT ORIGINAL SIZE

NOTES:

1. ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE RELATIVE TO ORDNANCE DATUM

REFERENCE DOCUMENTS AND DRAWINGS

DOCUMENT REFERENCES	DOCUMENT TITLES

Rev	Description	Checked	Approved	Date
Author	JDP	Drafting Check	EB	
Designer	EB	Design Check	PC	15/04/2024

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REGISTERED IN ENGLAND No. 2536455

Portsmouth Water

Future Water MJJV Ltd

coffey A TETRA TECH COMPANY

Project No: 03586AC

Client PORTSMOUTH WATER

Project HAVANT THICKET RESERVOIR

Status PLANNING APPLICATION

Status Code S4

Drawing Title MAIN EMBANKMENT CROSS-SECTIONS

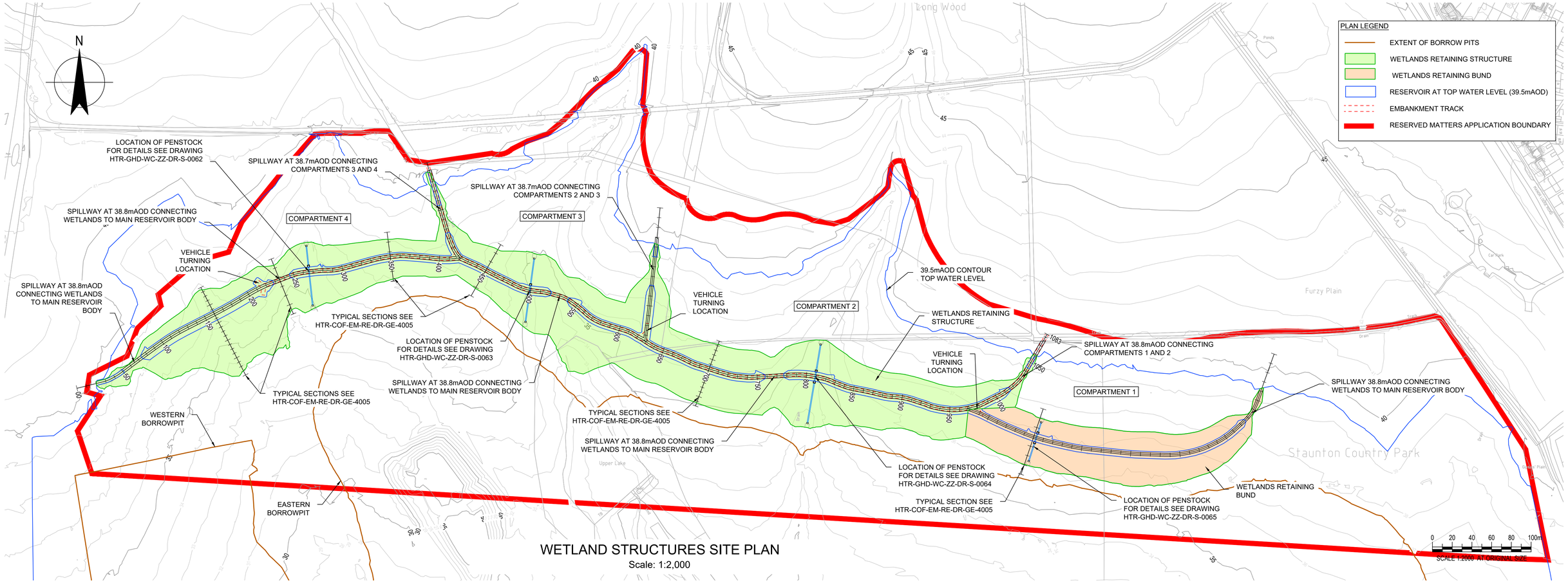
Size A1

HTR-COF-EM-RE-DR-GE-4003

Rev P01

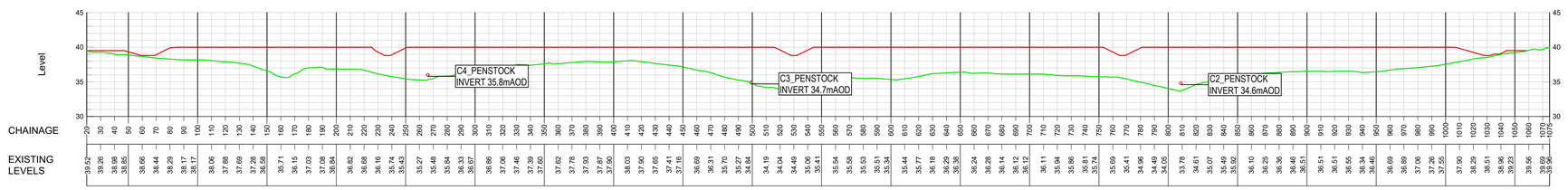
Plot Date: 15 April 2024 - 5:44 PM Plotted by: Poole, Jim

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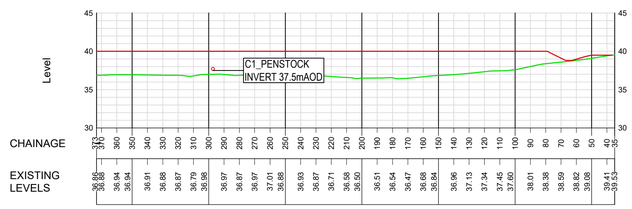
WETLAND STRUCTURES SITE PLAN

Scale: 1:2,000



WETLANDS RETAINING STRUCTURE LONG SECTION - COMPARTMENTS 2, 3 & 4

Scale: 1:2,000 (5 x VERTICAL EXAGGERATION)



WETLANDS RETAINING BUND LONG SECTION - COMPARTMENT 1

Scale: 1:2,000 (5 x VERTICAL EXAGGERATION)

SECTION LEGEND
- PROFILE OF EMBANKMENT TOP
- PROFILE OF EXISTING TOPOGRAPHY
- PENSTOCK PIPE LOCATIONS

NOTES:

1. ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE RELATIVE TO ORDNANCE SURVEY DATUM.
3. VISITOR CENTRE IS SUBJECT TO SEPARATE RESERVED MATTERS APPLICATION.

Rev	Description	Checked	Approved	Date
Author	JDP	Drafting Check	EB	
Designer	EB	Design Check	PC	04/03/2024

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REGISTERED IN ENGLAND No. 2536455

Portsmouth Water

Future Water MJJV Ltd

coffey A TETRA TECH COMPANY

Client: PORTSMOUTH WATER

Project: HAVANT THICKET RESERVOIR

Project No: 03586AC

Status: PLANNING APPLICATION Status Code: S4

Drawing Title: PLANNING DRAWING WETLANDS STRUCTURES PROPOSED SITE LAYOUT

Size: A1

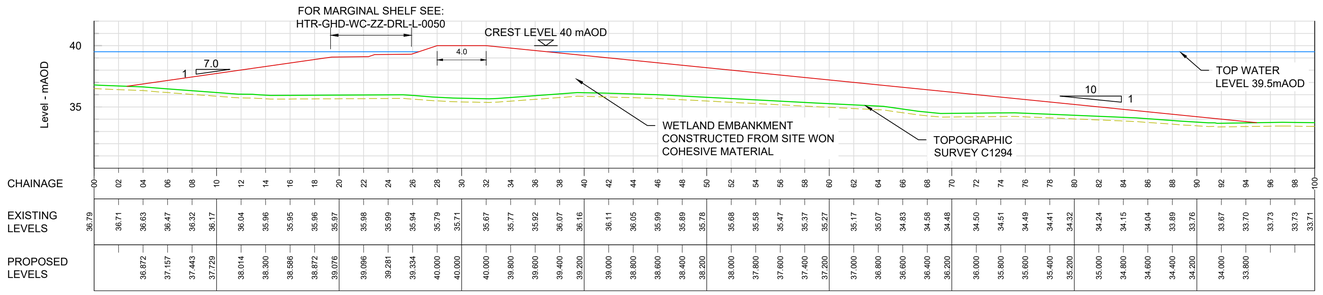
Rev: P01

HTR-COF-EM-RE-DR-GE-4004

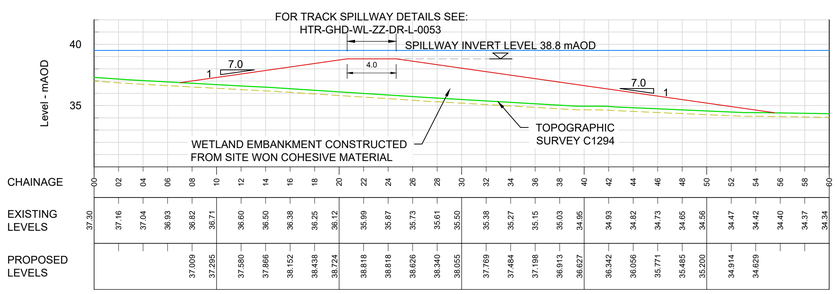
Plot Date: 4 March 2024 - 11:54 AM Plotted by: Poole, Jim

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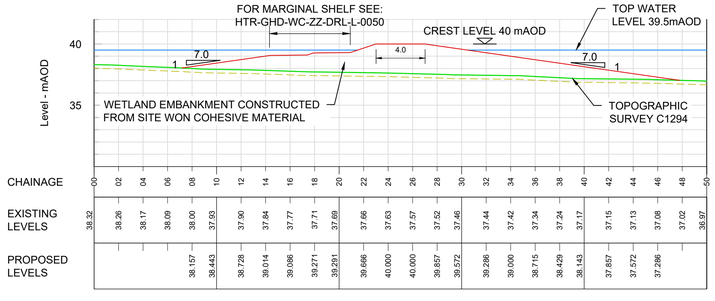
CROSS SECTION AT CH160 OF RETAINING STRUCTURE
Scale 1:250



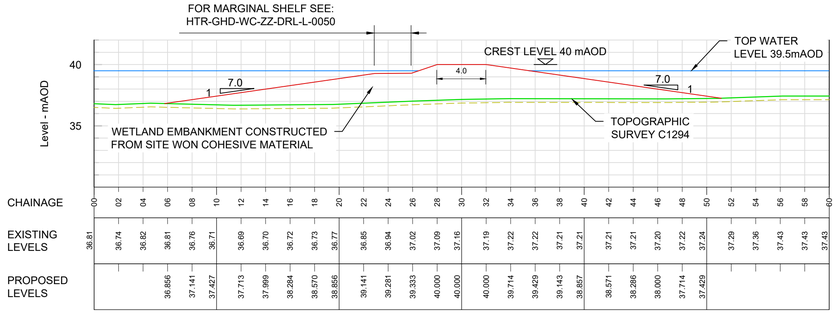
CROSS SECTION AT CH235 OF RETAINING STRUCTURE
Scale 1:250



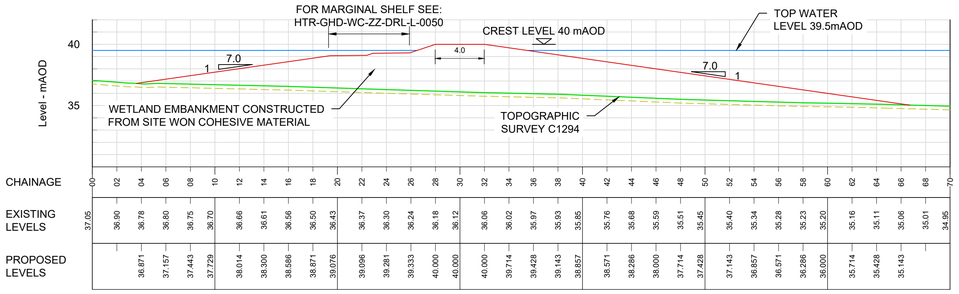
CROSS SECTION AT CH350 OF RETAINING STRUCTURE
Scale 1:250



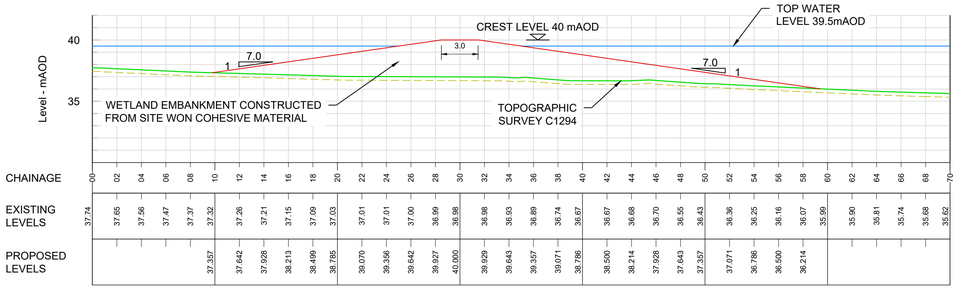
CROSS SECTION AT CH450 OF RETAINING STRUCTURE
Scale 1:250



CROSS SECTION AT CH700 OF RETAINING STRUCTURE
Scale 1:250



CROSS SECTION AT CH300 OF RETAINING BUND
Scale 1:250



SECTION LEGEND

- PROFILE OF EMBANKMENT TOP
- PROFILE OF EXISTING TOPOGRAPHY
- PROFILE OF TOPSOIL STRIP (-300mm)
- TOP WATER LEVEL AT 39.5mAOD

NOTES:

1. ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE RELATIVE TO ORDNANCE DATUM.

Rev	Description	Checked	Approved	Date

Author JDP | Drafting Check EB
Designer EB | Design Check PC | 16/02/2024

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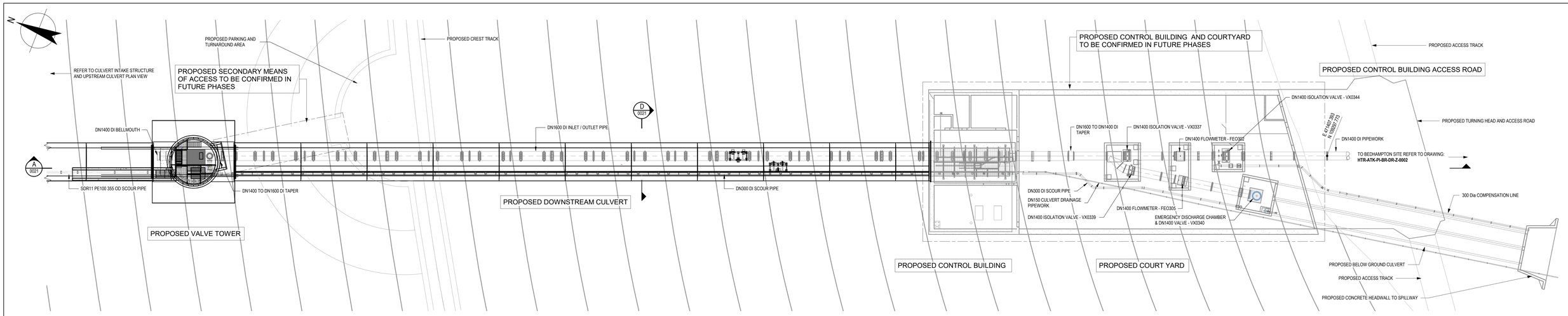
coffey A TERRA TECH COMPANY

Client: PORTSMOUTH WATER
Project: HAVANT THICKET RESERVOIR
Project No: 03586AC
Status: PLANNING APPLICATION | Status Code: S4

Drawing Title: PLANNING DRAWING
WETLANDS
EMBANKMENTS
DESIGN CROSS SECTIONS

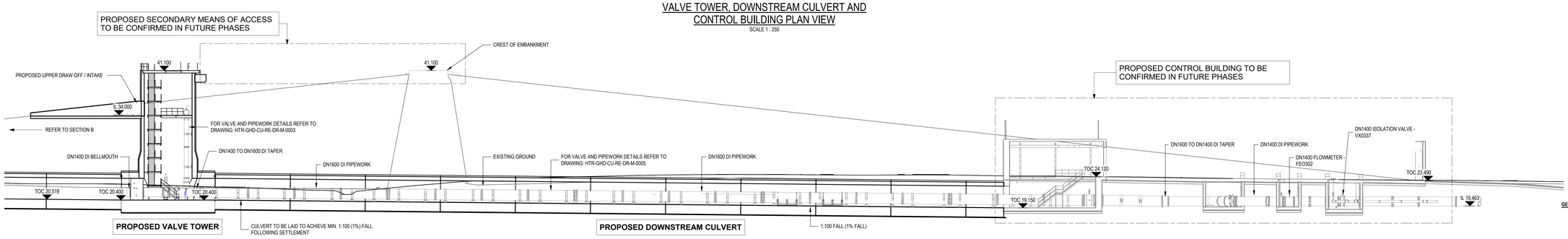
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HTR-COF-EM-RE-DR-GE-4005
Rev: P01

Plot Date: 4 March 2024 - 11:52 AM | Plotted by: Poole, Jim | File Name: M:\3500 series\03586ac - htr enabling works\Drawings\1 CWD\03586AC_D_21.12 WRB - Planning Application.dwg



VALVE TOWER, DOWNSTREAM CULVERT AND CONTROL BUILDING PLAN VIEW

SCALE 1 : 250



GENERAL NOTES

1. ALL DIMENSIONS RELEVANT TO SETTING OUT AND OFF-SITE WORK SHALL BE VERIFIED BY THE CONTRACTOR.
2. WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EUROCODES AND CODES OF PRACTICE AND ALL RELEVANT CURRENT STATUTORY AUTHORITY REQUIREMENTS
3. THIS DRAWING SHALL BE READ IN CONJUCTION WITH THE SPECIFICATIONS, AND ALL RELEVANT ENGINEERING PROJECT DOCUMENTATION.
4. EXCEPT WHERE OTHERWISE DESCRIBED BELOW, EXECUTION SHALL BE IN COMPLIANCE WITH THE FOLLOWING STANDARDS:
   CONCRETE STRUCTURES: BS EN 13670:2009
5. ALL PROPRIETARY PRODUCTS TO BE USED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. ALL EQUIPMENT PROVIDED SHALL BE SUITABLE FOR USE IN A POTABLE WATER.
7. ALL PIPELINE MATERIALS SHALL HAVE DWI APPROVAL
8. DENSO TYPE TAPE WRAP (OR SIMILAR APPROVED) SHALL BE FIXED AROUND ALL BURIED FLANGE JOINTS/FITTINGS.

LEVELS AND DIMENSIONS

1. ALL LEVELS SHOWN ARE FINAL DESIGN LEVELS, FOR CONSTRUCTION LAYOUT REFER TO HTR-GHD-CU-RE-DR-S-0020.
2. DIMENSIONS ARE NOT TO BE SCALED.
3. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. ALL LEVELS ARE SHOWN IN METRES ABOVE ORDNANCE (mAOD)
5. ALL COORDINATES ARE IN METRES TO OS GRID.
6. ALL EXISTING DIMENSIONS AND LEVELS ARE TO BE CONFIRMED ON SITE.
7. FOR ALL CONTRACTION JOINT DETAILS REFER TO DRAWING: HTR-GHD-CU-RE-DR-S-0052 & HTR-GHD-CU-RE-DR-S-0053

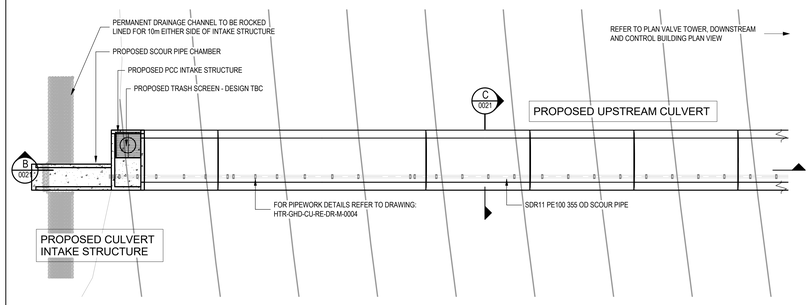
REFERENCE DRAWINGS:

CULVERT AND TOWER DRAWINGS LIST

HTR-GHD-ZZ-RE-DR-Z-0020 - COVER SHT SITE LOCATION PLAN & DRAWING LIST
HTR-GHD-ZZ-RE-DR-Z-0021 - GENERAL NOTES
HTR-GHD-CU-RE-DR-S-0030 - CULVERT & VALVE TOWER SETTING OUT PLAN
HTR-GHD-CU-RE-DR-S-0020 - OUTLET CULVERT EXCAVATION PLAN & SECTION
HTR-GHD-CU-RE-DR-S-0021 - OVERALL GENERAL ARRANGEMENT PLAN & SECTION
HTR-GHD-CU-RE-DR-S-0023 - UPSTREAM CULVERT PLAN & SECTION - SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0024 - UPSTREAM CULVERT PLAN & SECTION - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0052 - UPSTREAM CULVERT CONCRETE DETAILS - PLAN & SECTIONS
HTR-GHD-CU-RE-DR-S-0026 - DOWNSTREAM CULVERT PLAN & SECTION - SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0027 - DOWNSTREAM CULVERT PLAN & SECTION - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0053 - DOWNSTREAM CULVERT CONCRETE DETAILS - PLAN & SECTIONS
HTR-GHD-CU-RE-DR-S-0040 - VALVE TOWER GENERAL ARRANGEMENT - SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0043 - VALVE TOWER GENERAL ARRANGEMENT - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0050 - VALVE TOWER CONCRETE DETAILS - PLAN & SECTIONS SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0051 - VALVE TOWER CONCRETE DETAILS - PLAN & SECTIONS SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0100 - CULVERT RC TYPICAL DETAILS - SHT 1 of 2
HTR-GHD-CU-RE-DR-S-0101 - CULVERT RC TYPICAL DETAILS - SHT 2 of 2
HTR-GHD-CU-RE-DR-S-0101 - CULVERT RC TYPICAL DETAILS BAR BENDING SCHEDULES - SHT 2 of 2
HTR-GHD-CU-RE-SC-S-0100 - CULVERT RC TYPICAL DETAILS BAR BENDING SCHEDULES - SHT 1 of 2
HTR-GHD-CU-RE-DR-S-0150 - VALVE TOWER BASE RC DETAILS
HTR-GHD-CU-RE-SC-S-0150 - VALVE TOWER BASE BAR BENDING SCHEDULES
HTR-GHD-CU-RE-DR-S-0151 - VALVE TOWER WALL TYPICAL DETAILS - SHT 1 of 3
HTR-GHD-CU-RE-DR-S-0152 - VALVE TOWER WALL TYPICAL DETAILS - SHT 2 of 3
HTR-GHD-CU-RE-DR-S-0153 - VALVE TOWER WALL TYPICAL DETAILS - SHT 3 of 3
HTR-GHD-CU-RE-SC-S-0151 - VALVE TOWER WALL BAR BENDING SCHEDULES - SHT 1 OF 2
HTR-GHD-CU-RE-SC-S-0152 - VALVE TOWER WALL BAR BENDING SCHEDULES - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0500 - VALVE TOWER BAULKHEAD RC DETAIL
HTR-GHD-CU-RE-SC-S-0500 - VALVE TOWER BAULKHEAD BAR BENDING SCHEDULES

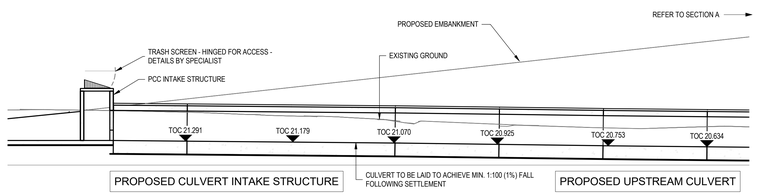
MECHANICAL

HTR-GHD-CU-RE-DR-M-0001 - PROCESS & INSTRUMENTATION DIAGRAM
HTR-GHD-CU-RE-DR-M-0002 - VALVE TOWER
HTR-GHD-CU-RE-DR-M-0003 - DOWNSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0004 - CONTROL ROOM
HTR-GHD-CU-RE-DR-M-0005 - CONTROL ROOM COURTYARD
HTR-GHD-CU-RE-DR-M-0006 - COMPENSATION FLOW LINE
HTR-GHD-CU-RE-DR-M-0007 - SCOUR PIPEWORK UPSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0008 - SCOUR PIPEWORK DOWNSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0009 - SCOUR PIPEWORK CONTROL ROOM & COURTYARD
HTR-GHD-CU-RE-DR-M-0010 - VALVE SCHEDULE



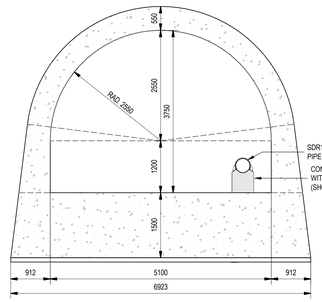
CULVERT INTAKE STRUCTURE AND UPSTREAM CULVERT PLAN VIEW

SCALE 1 : 250



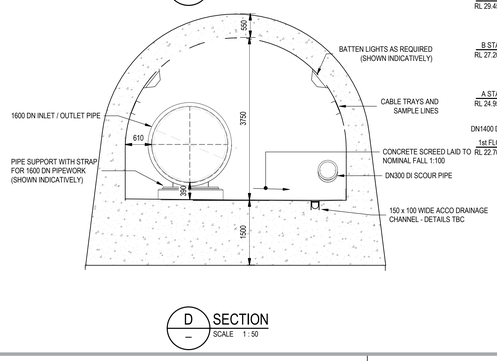
B SECTION

SCALE 1 : 250



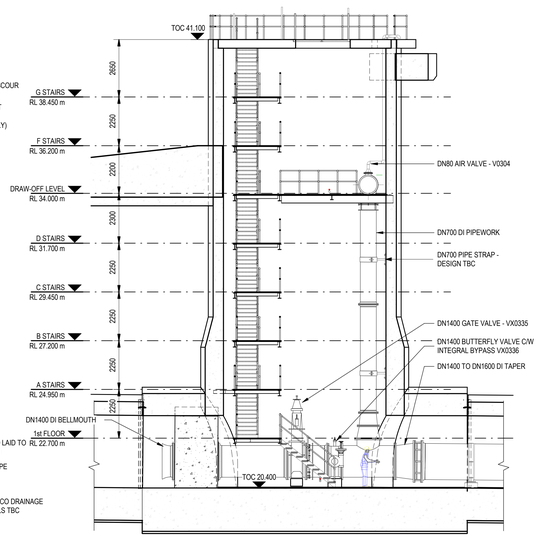
C SECTION

SCALE 1 : 50



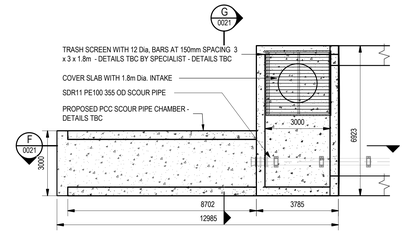
D SECTION

SCALE 1 : 50



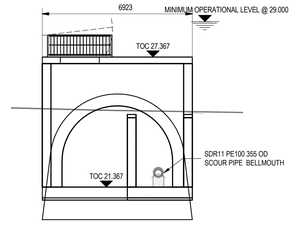
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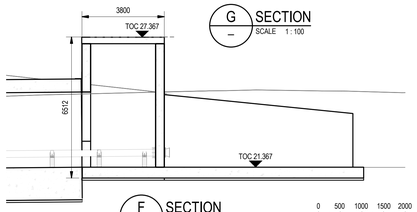
SCALE 1 : 100



INTAKE STRUCTURE PLAN VIEW

SCALE 1 : 100





G SECTION

SCALE 1 : 100

F SECTION

SCALE 1 : 100

SCALE 1:50 AT ORIGINAL SIZE (0 500 1000 1500 2000 2500mm)
SCALE 1:100 AT ORIGINAL SIZE (0 1000 2000 3000 4000 5000mm)
SCALE 1:250 AT ORIGINAL SIZE (0 2500 5000 7500 10000 12500mm)

Rev	Description	Checked	Approved	Date
P05	FOR PLANNING	AH	JR	09.02.24
P04	FOR REVIEW AND COMMENT	AH	JR	07/02/24
P03	FOR PLANNING	JR	KNG	08/12/23
P02	FOR REVIEW AND COMMENT	AP	JR	23/11/23
P01	FOR REVIEW AND COMMENT	AP	JR	14/11/23

Author IA | Drafting Check ST | Reg No.
Designer AP | Design Check JR | Date 28.09.2023

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Portsmouth Water

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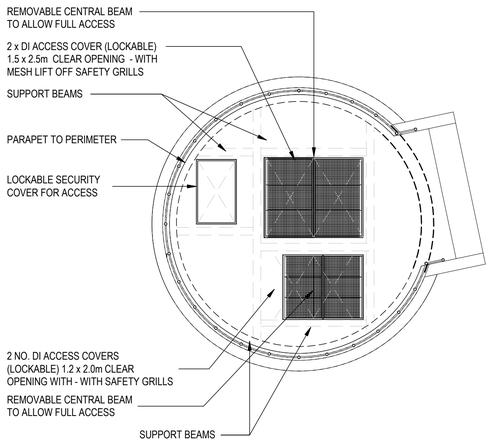
GHD
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E UKmail@ghd.com W www.ghd.com
www.ghd.com

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Client PORTSMOUTH WATER
Project HAVANT THICKET RESERVOIR
Project No. HTR
Status FOR PLANNING | Status Code

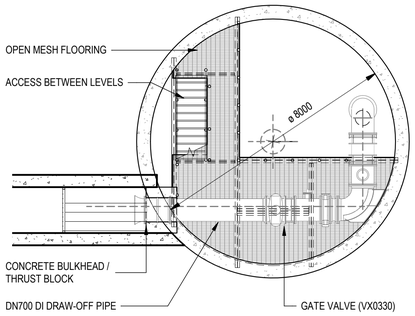
Drawing Title OVERALL GENERAL ARRANGEMENT PLAN AND SECTIONS
Size A0
Drawing No. HTR-GHD-CU-RE-DR-S-0021
Rev P05

Plot Date: 09/02/2024 08:33:42
File Name: Autodesk Docs://12547181 - Havant Thicket Reservoir/HTR-GHD-CU-RE-M3-S-0002.rvt



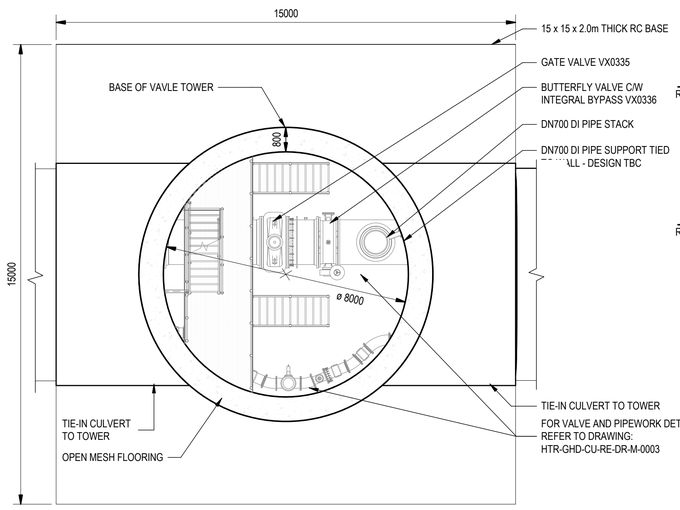
PLAN: TOP OF TOWER

SCALE 1 : 100



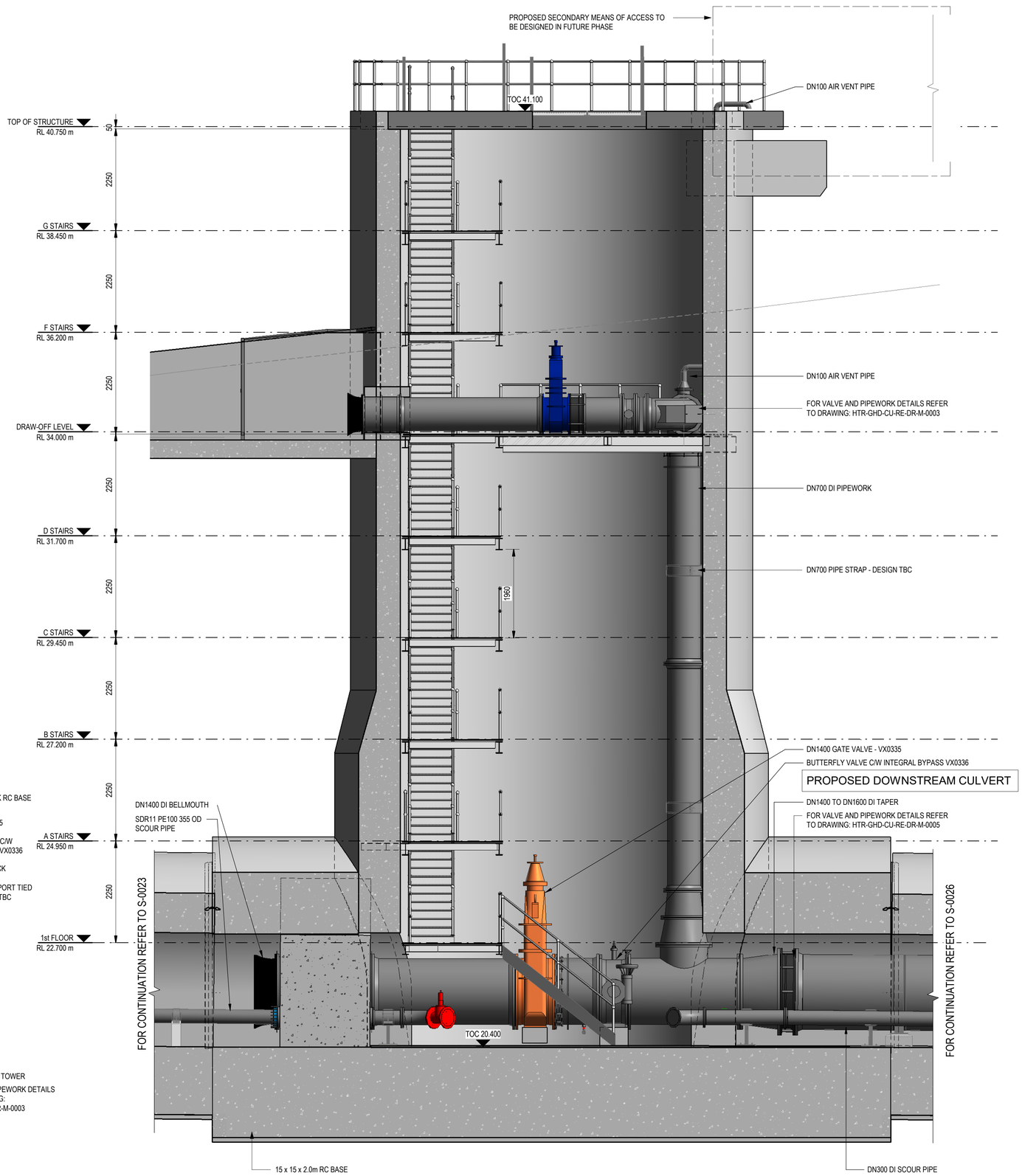
PLAN: DRAW OFF VALVE LEVEL

SCALE 1 : 100



PLAN: BASE OF TOWER LEVEL

SCALE 1 : 100



TOWER SECTION

SCALE 1 : 50

0 500 1000 1500 2000 2500 mm
SCALE 1:50 AT ORIGINAL SIZE

0 1000 2000 3000 4000 5000 mm
SCALE 1:100 AT ORIGINAL SIZE

GENERAL NOTES

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6. ALL EQUIPMENT PROVIDED SHALL BE SUITABLE FOR USE IN A POTABLE WATER.
7. ALL PIPELINE MATERIALS SHALL HAVE DWI APPROVAL.
8. DENSO TYPE TAPE WRAP (OR SIMILAR APPROVED) SHALL BE FIXED AROUND ALL BURIED FLANGE JOINTS/FITTINGS.

LEVELS AND DIMENSIONS

1. ALL LEVELS SHOWN ARE FINAL DESIGN LEVELS, FOR CONSTRUCTION LAYOUT REFER TO HTR-GHD-CU-RE-DR-S-0020.
2. DIMENSIONS ARE NOT TO BE SCALED.
3. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. ALL LEVELS ARE SHOWN IN METRES ABOVE ORDNANCE (mAOD)
5. ALL COORDINATES ARE IN METRES TO OS GRID.
6. ALL EXISTING DIMENSIONS AND LEVELS ARE TO BE CONFIRMED ON SITE.
7. FOR ALL CONTRACTION JOINT DETAILS REFER TO DRAWING:
   HTR-GHD-CU-RE-DR-S-0052 & HTR-GHD-CU-RE-DR-S-0053

REFERENCE DRAWINGS:

CULVERT AND TOWER DRAWINGS LIST

HTR-GHD-ZZ-RE-DR-Z-0020 - COVER SHEET SITE LOCATION PLAN & DRAWING LIST
HTR-GHD-ZZ-RE-DR-Z-0021 - GENERAL NOTES - SHT 1 OF 2
HTR-GHD-ZZ-RE-DR-Z-0022 - GENERAL NOTES - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0030 - CULVERT & VALVE TOWER SETTING OUT PLAN
HTR-GHD-CU-RE-DR-S-0020 - OUTLET CULVERT EXCAVATION PLAN & SECTION
HTR-GHD-CU-RE-DR-S-0021 - OVERALL GENERAL ARRANGEMENT PLAN & SECTION
HTR-GHD-CU-RE-DR-S-0023 - UPSTREAM CULVERT PLAN & SECTION
HTR-GHD-CU-RE-DR-S-0052 - UPSTREAM CULVERT CONCRETE DETAILS - PLAN & SECTIONS
HTR-GHD-CU-RE-DR-S-0026 - DOWNSTREAM CULVERT PLAN & SECTION - SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0027 - DOWNSTREAM CULVERT PLAN & SECTION - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0053 - DOWNSTREAM CULVERT CONCRETE DETAILS - PLAN & SECTIONS
HTR-GHD-CU-RE-DR-S-0040 - VALVE TOWER GENERAL ARRANGEMENT - SHT 1 OF 2
HTR-GHD-CU-RE-DR-S-0043 - VALVE TOWER GENERAL ARRANGEMENT - SHT 2 OF 2
HTR-GHD-CU-RE-DR-S-0050 - VALVE TOWER CONCRETE DETAILS - PLAN & SECTIONS SHEET 1 OF 2
HTR-GHD-CU-RE-DR-S-0051 - VALVE TOWER CONCRETE DETAILS - PLAN & SECTIONS SHEET 2 OF 2

MECHANICAL

HTR-GHD-CU-RE-DR-M-0001 - PROCESS & INSTRUMENTATION DIAGRAM
HTR-GHD-CU-RE-DR-M-0002 - VALVE TOWER
HTR-GHD-CU-RE-DR-M-0003 - DOWNSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0004 - CONTROL ROOM
HTR-GHD-CU-RE-DR-M-0005 - CONTROL ROOM COURTYARD
HTR-GHD-CU-RE-DR-M-0006 - COMPENSATION FLOW LINE
HTR-GHD-CU-RE-DR-M-0007 - SCOUR PIPEWORK UPSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0008 - SCOUR PIPEWORK DOWNSTREAM CULVERT
HTR-GHD-CU-RE-DR-M-0009 - SCOUR PIPEWORK CONTROL ROOM & COURTYARD
HTR-GHD-CU-RE-DR-M-0010 - VALVE SCHEDULE

Rev	Description	Checked	Approved	Date
P05	FOR PLANNING	AH	JR	09.02.24
P04	FOR PLANNING	JR	KNG	08/12/23
P03	FOR REVIEW AND COMMENT	AP	JR	20/10/23
P02	FOR PLANNING	JR	JR	12/10/23
P01	FOR PLANNING	IA	KN	28/09/23
-	WIP	WIP	WIP	WIP

Author WIP **Drafting Check** WIP **Reg No.**
Designer WIP **Design Check** WIP **Date**

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Project No. HTR

Client PORTSMOUTH WATER

Project HAVANT THICKET RESERVOIR

Status FOR PLANNING

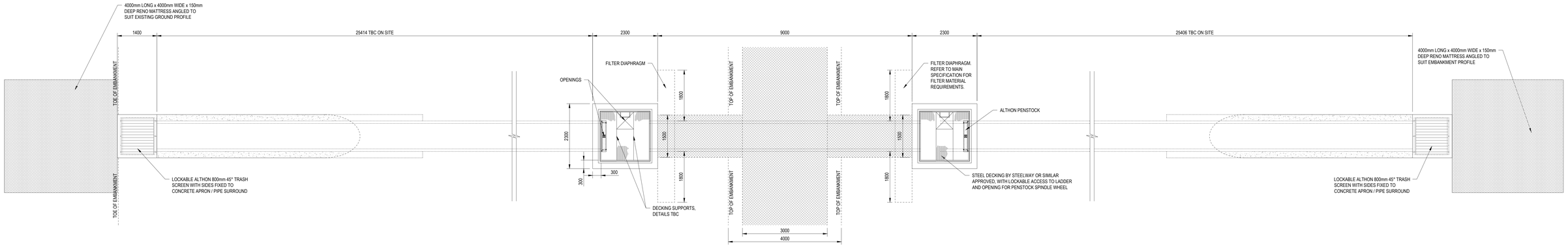
Drawing Title VALVE TOWER GENERAL ARRANGEMENT SHEET 2 OF 2

Size A1

Drawing No. HTR-GHD-CU-RE-DR-S-0043

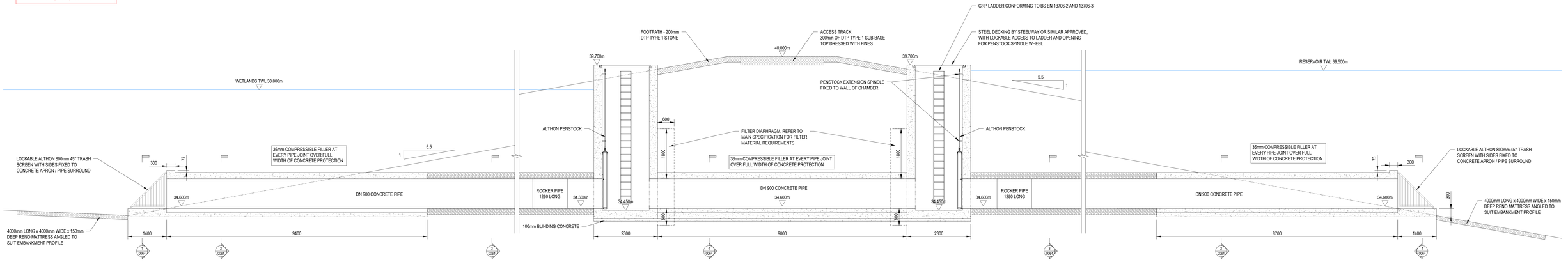
Rev P05

Plot Date: 12/02/2024 12:29:59 File Name: Autodesk Docs://12547181 - Havant Thicket Reservoir/HTR-GHD-CU-RE-M3-S-0002.rvt



PLAN OF PENSTOCK CHAMBERS AND ACCESS TRACK BUND.
SCALE 1:50

REINFORCEMENT REQUIREMENTS FOR PENSTOCK CHAMBERS AND CONCRETE PROTECTION TO PIPEWORK TO BE CONFIRMED.



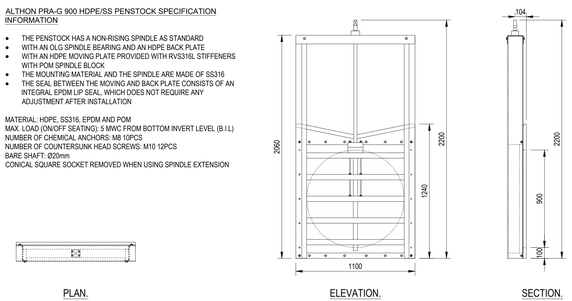
CROSS SECTION THROUGH PENSTOCK CHAMBERS AND ACCESS TRACK BUND.
SCALE 1:50

0 500 1000 1500 2000 2500mm
SCALE 1:50 AT ORIGINAL SIZE

ALTHON PRA-G 900 HDPE/SS PENSTOCK SPECIFICATION INFORMATION

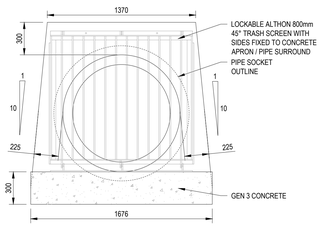
- THE PENSTOCK HAS A NON-RISING SPINDLE AS STANDARD
- WITH AN OLG SPINDLE BEARING AND AN HDPE BACK PLATE
- WITH AN HDPE MOVING PLATE PROVIDED WITH RVS316L STIFFENERS WITH POM SPINDLE BLOCK
- THE MOUNTING MATERIAL AND THE SPINDLE ARE MADE OF SS316
- THE SEAL BETWEEN THE MOVING AND BACK PLATE CONSISTS OF AN INTEGRAL EPDM LIP SEAL, WHICH DOES NOT REQUIRE ANY ADJUSTMENT AFTER INSTALLATION

MATERIAL: HDPE, SS316, EPDM AND POM
MAX. LOAD (ON/OFF SEATING): 5 MWC FROM BOTTOM INVERT LEVEL (B.I.L)
NUMBER OF CHEMICAL ANCHORS: M8 10PCS
NUMBER OF COUNTERSUNK HEAD SCREWS: M10 12PCS
BARE SHAFT: Ø20mm
CONICAL SQUARE SOCKET REMOVED WHEN USING SPINDLE EXTENSION

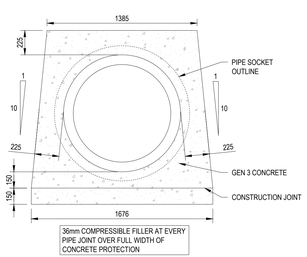


PLAN. ELEVATION. SECTION.

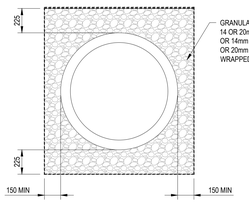
ALTHON 900mm HDPE PENSTOCK.
SCALE 1:20



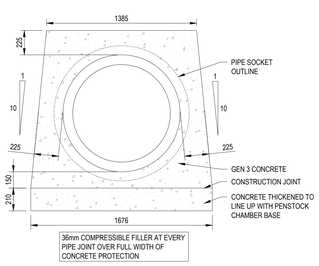
SECTION 1 - TRASH SCREEN APRON.
SCALE 1:20



SECTION 2 - CONCRETE PROTECTION TO PIPE.
SCALE 1:20



SECTION 3 - CLASS S BEDDING DETAIL FOR 900mm DIA PIPE.
SCALE 1:20



SECTION 4 - CONCRETE PROTECTION TO PIPE BETWEEN PENSTOCK CHAMBERS.
SCALE 1:20

0 200 400 600 800 1000mm
SCALE 1:20 AT ORIGINAL SIZE

Rev	Description	Checked	Approved	Date
P03	UPDATED FOLLOWING INTERNAL REVIEW	LJG	JR	23.10.23
P02	REVIEW 167 COMMENTS + UPDATED BUND PROFILE	LJG	JR	20.09.23
P01	ISSUED FOR COMMENT	LJG	JR	24.08.23

Author PAR Drafting Check LJG
Designer PAR / LJG Design Check LJG

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM UNO.
3. DO NOT SCALE FROM THIS DRAWING. IF IN DOUBT, CONSULT THE ENGINEER.
4. ALL CO-ORDINATES ARE RELATIVE TO OS NATIONAL GRID.

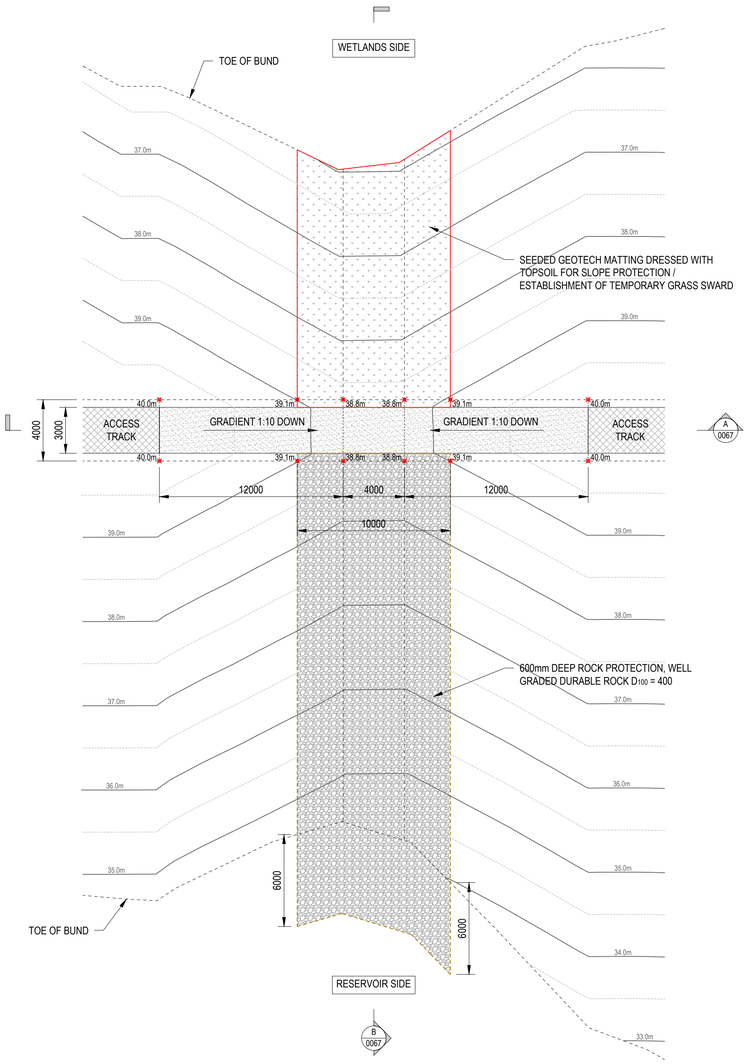
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REGISTERED IN ENGLAND No. 2536455

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Project No. 12547181

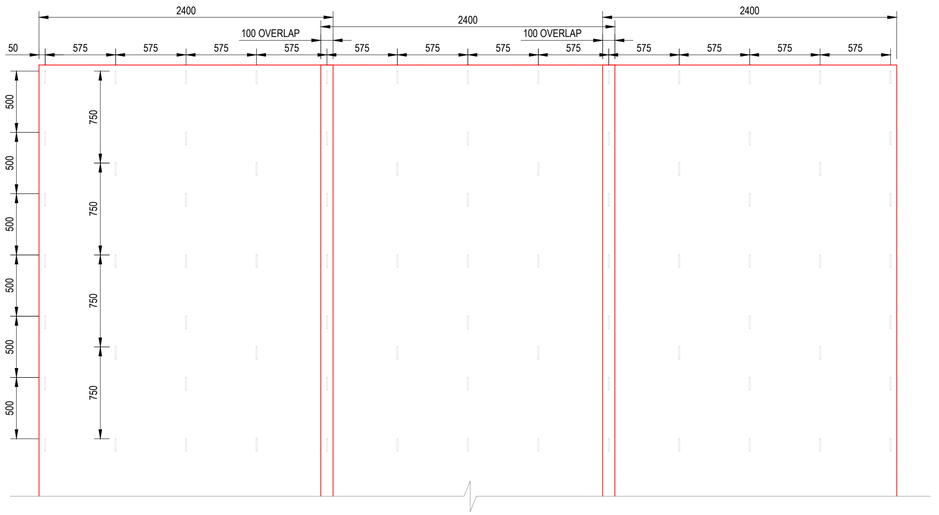
Client PORTSMOUTH WATER
Project HAVANT THICKET RESERVOIR
Status FOR APPROVAL Status Code S4

Drawing Title WETLANDS ACTIVE WATER CONTROL PENSTOCK CHAMBER DETAILS COMPARTMENT 2
Size A0
Drawing No. HTR-GHD-WC-ZZ-DR-L-0064
Rev P03

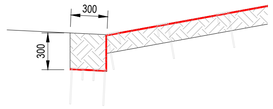
Plot Date: 23 October 2023 - 2:06 PM Plotted by: Peter Robinson
File Name: C:\Users\PRobinson\DC\ACCDocs\GHD Services Pty Ltd\12547181 - Havant Thicket Reservoir\Project Data & Docs\WIP (S0)\GHD Engineers\Wetlands & Landscaping (10)\Drawings\HTR-GHD-WC-ZZ-DR-L-0064.dwg



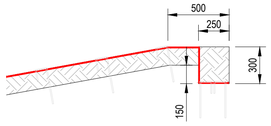
PLAN OF SPILLWAY
SCALE 1:200



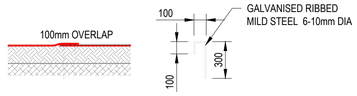
TYPICAL PIN FIXING LAYOUT FOR SEEDED GEOTECH MATTING.
(REFER TO MANUFACTURES SPECIFICATION)
SCALE 1:25



TYPICAL FIXING AT TOE OF BUND.
SCALE 1:25

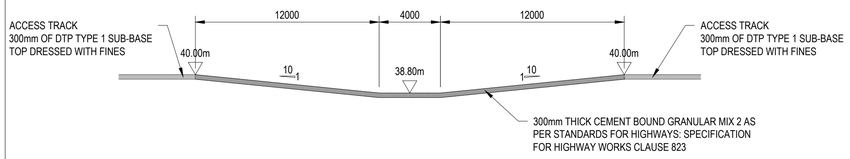


TYPICAL FIXING AT TOP OF BUND.
SCALE 1:25

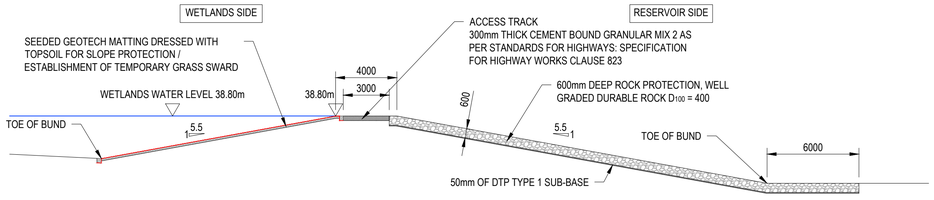


FIXING PIN DETAIL.
SCALE 1:25

0 250 500 750 1000 1250mm
SCALE 1:25 AT ORIGINAL SIZE



SECTION A - A.
SCALE 1:200



SECTION B - B.
SCALE 1:200

0 2000 4000 6000 8000 10000mm
SCALE 1:200 AT ORIGINAL SIZE

NOTES.
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE (UNO).
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM UNO.
3. DO NOT SCALE FROM THIS DRAWING. IF IN DOUBT, CONSULT THE ENGINEER.
4. ALL CO-ORDINATES ARE RELATIVE TO OS NATIONAL GRID.

REFERENCE DOCUMENTS AND DRAWINGS

PLEASE REFER TO THE BELOW DRAWINGS:

HTR-GHD-WC-ZZ-DR-L-0005 - WETLAND EMBANKMENT SPILLWAY DETAIL WITH TRACK

Rev	Description	Checked	Approved	Date
P03	FOR APPROVAL	LJG	JR	31.10.23
P02	FOR COMMENT	LJG	JR	11.10.23
P01	FOR COMMENT	LJG	JR	09.10.23

Author PAR **Drafting Check** LJG

Designer PAR **Design Check** LJG

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Portsmouth Water

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Project No. 12547181

Client PORTSMOUTH WATER

Project HAVANT THICKET RESERVOIR

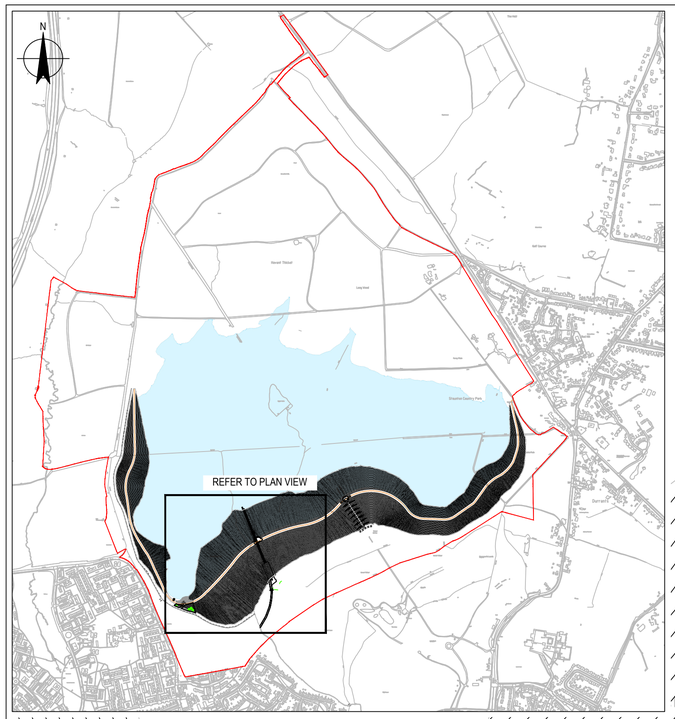
Status FOR APPROVAL Status Code S4

Drawing Title WETLANDS SPILLWAY (VEHICULAR ACCESS) PLAN AND SECTIONS

Size A1

Drawing No. HTR-GHD-WC-ZZ-DR-L-0067 Rev P03

Plot Date: 31 October 2023 - 6:19 PM Plotted by: Franz Alexis Juanico File Name: C:\Users\fjuanico\DC\ACCDocs\GHD Services Pty Ltd\12547181 - Havant Thicket Reservoir\Project Data & Docs\WIP (S0)\GHD Engineers\Wetlands & Landscaping (10)\Drawings\HTR-GHD-WC-ZZ-DR-L-0067.dwg



LOCATION PLAN
SCALE 1:12500

SCALE 1 : 12500

0m50 0 50m

SITE LAYOUT.
SCALE 1:1000

0 10 20 30 40 50m

SCALE 1:1000 AT ORIGINAL SIZE

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm) & ALL LEVELS ARE IN METERS (m) AOD, UNLESS STATED OTHERWISE.
2. ALL LEVELS SHOWN ARE RELATIVE TO ORDNANCE DATUM.

LEGEND

- PLANNING APPLICATION BOUNDARY
- RESERVOIR AREA
- PROPOSED BELOW GROUND CULVERT
- PROPOSED ACCESS TRACK (TOP OF EMBANKMENT)

Rev	Description	Checked	Approved	Date
P03	FOR APPROVAL	SG	TG	16.04.24
P02	DESIGN AMENDMENTS	SG	TG	12.04.24
P01	FOR COMMENT	SG	TG	09.04.24

Author I Ahmed **Drafting Check** AP

Designer AP **Design Check** JR

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Project No. 12547181

Client PORTSMOUTH WATER

Project HAVANT THICKET RESERVOIR

Status FOR PLANNING — Status Code. **S4**

Drawing Title PROPOSED CULVERT AND VALVE TOWER SITE LAYOUT

Size

Drawing No. HTR-GHD-ZZ-ZZ-DR-T-0013

Rev P03

Plot Date: 16 April 2024 - 3:38 PM Plotted by: Ibrar Ahmed File Name: C:\Users\Iahmed\DC\ACCDocs\GHD Services Pty Ltd\12547181 - Havant Thicket Reservoir\Project Data & Docs\WIP (S0)\GHD Engineers\Multiple Systems (ZZ)\Models\AutoCAD\HTR-GHD-ZZ-ZZ-DR-T-0013.dwg

Appendix 2 Ordinary Watercourse Consent Application

HAVANT THICKET RESERVOIR

ORDINARY WATERCOURSE CONSENT APPLICATION

PHASE 1 –
EXISTING WATERCOURSE / TEMPORARY DRAINAGE REALIGNMENT & REGRADING

DOCUMENT REFERENCE – HTR/OWC/FW01

CONTENTS

1.0 INTRODUCTION

2.0 TYPE OF CONSENT

3.0 CONSENTING REQUIREMENTS

4.0 ENVIRONMENTAL & ECOLOGICAL STATEMENT

5.0 METHOD STATEMENT

6.0 MAINTENANCE STATEMENT

7.0 SITE PHOTOGRAPHS

APPENDIX 1 - DESIGN DRAWINGS

1.0 INTRODUCTION

This Ordinary Water Consent (OWC) application has been prepared to clarify the consenting requirements for the proposed diversions of the watercourses that drain Havant Thicket. These watercourses form the headwaters of the Riders Lane Stream, which flows southwards from Havant Thicket before joining Hermitage Stream to the south of Purbrook Way in Havant.

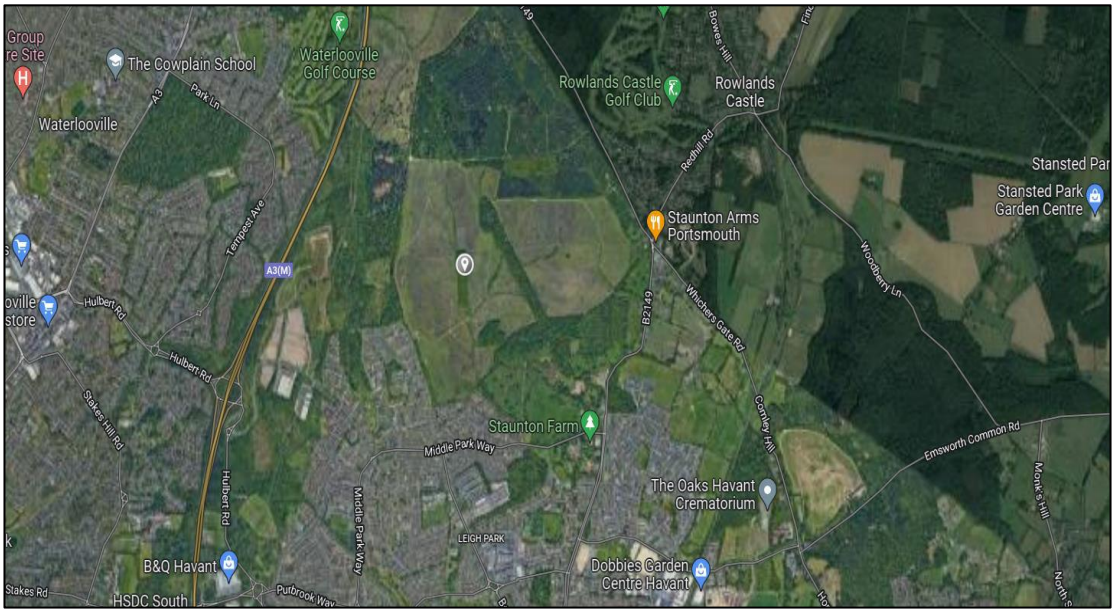


Figure 1. Site location – Havant Thicket Reservoir (HTR), Swanmore Road, Havant, PO9 4ET.

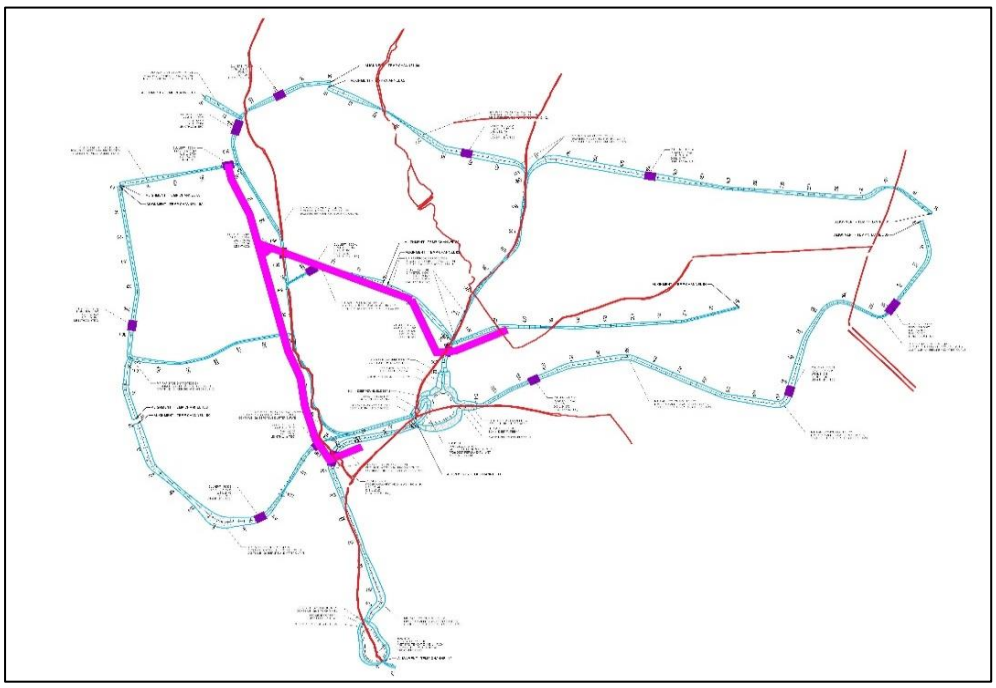


Figure 2. General arrangement of proposed HTR, drainage management and existing watercourses plan.

2.0 TYPE OF CONSENT

This Ordinary Watercourse Consent (OWC) (also known as Land Drainage Consent) from the Lead Local Flood Authority, in this case Hampshire County Council, is required for activities that could affect an 'ordinary watercourse' (i.e. a watercourse that is not included on the statutory Main River Map).

3.0 CONSENTING REQUIREMENTS

The proposed temporary watercourse realignment and regrading will be carried out on the headwater tributaries of Riders Lane Stream, upstream of Deerslaughter Plain. Although Riders Lane Stream is classified as a main river, the main river designation only applies to the watercourse downstream of the confluence with the outflow from The Lake. The proposed works therefore take place on an ordinary watercourse, and not on a main river.

The temporary drainage general arrangement design drawing details a largescale network of new ditches and culverts which intercept the existing watercourse flows and how they will interact.

4.0 ENVIRONMENTAL & ECOLOGICAL STATEMENT

- FW will adopt best practice to avoid pollution of watercourses. This is to include but is not limited to adherence to FW Environmental Management Plan, FW Environmental Aspects and Impact Table, Guidelines for Pollution Prevention (GPP), latest Environment Agency pollution guidance available from data.gov, and Construction Industry Research and Information Associated (CIRIA) guidance.
- A water quality monitoring strategy will be included within the Works CEMP. This makes provision for parameters monitored, sample locations frequency and duration of monitoring and includes undertaking of sampling, any requirements for visual checks, inclusion of additional monitoring points as part of baseline monitoring, sampling/ laboratory analysis accreditation requirements.
- The strategy makes provision for continuous flow and water quality monitoring in downstream watercourses as well as visual daily monitoring being undertaken to ensure that the discharge does not result in any scouring of the beds and banks or churn up of silts.
- Silt control measures to be applied to control siltation risks associated with de-watering activities and construction related discharges.
- A detailed environmental and ecological site survey to be undertaken prior to commencement of any works.
- An ecological monitoring strategy will be included within the Works CEMP. This will make provision for duration of monitoring and requirements for visual checks.
- Refer to General Arrangement drawing ref: B038779-TTE-00-XX-DR-C-0500 rev P06. for general details, included within Appendix 1 of this OWC Application.

5.0 METHOD STATEMENT

- Duration of works – 9no. weeks.
- Refer to the following design drawings for general arrangement, long sections and construction details, included within Appendix 1 of this OWC Application -

  Temporary Drainage General Arrangement – B038779/TTE/00/XX/DR/C/0510
  Temporary Drainage Long Section 1 of 2 - B038779/TTE/00/XX/DR/C/0501
  Temporary Drainage Long Section 2 of 2 - B038779/TE/00/XX/DR/C/0502
  Open Channel Details - B038779/TE/00/XX/DR/C/0551
  Basin Details - B038779/TE/00/XX/DR/C/0552
  Culverted Crossing Details - B038779/TE/00/XX/DR/C/0553
  Channel Schedules - B038779/TE/00/XX/DR/C/0560

- Where any vegetation and/or roots are present within existing watercourse, they will be checked by ecologist prior to removal.
- Silt fencing will be installed downstream of the works to catch any displaced sediment.
- Where applicable the existing watercourse will be excavated and any topsoil/roots removed by an excavator.
- Where required redundant watercourses will either be backfilled or excavated out when the works borrow pits are constructed
- Where required, existing culverts will be checked by an FW Engineer to ensure suitability for plant crossing. If required, culverts will be removed and replaced as per the design drawing construction details.
- Specified pipework will be installed on a stone bedding.
- Levels will be checked by the FW Site Engineer to ensure sufficient fall within the culverts.
- Once approved, the culverts will be surround with suitable fill. This will be compacted in layers with a whacker plate.
- Sandbags to be placed around around pipeline with embedded pipes to enable drain down and prevent buildup of water behind sandbags.
- Sandbags to be placed around pipeline at 17:1 gradient.
- Place 1 ton bulk bags to stabalise temporary headwall and provide edge protection.
- Construction of open channel detail, to include rip-rap erosion control.
- Construction of open channel detail, to include deployment of erosion control matting.
- Construction of basin and sediment forebay including rip-rap permeable berm and rip-rap flow spreader.
- Sandbags will be installed on the upstream end of the culvert to ensure no erosion is caused and water is directed through the pipework.
- All items of plant will be inspected prior to use to ensure no leaks are present.

6.0 MAINTENANCE STATEMENT

- All culverts, open channels, rip-raps and basins will be inspected on a daily basis though out the Works by FW Section Works Manager.
- No works will commence prior to the daily inspection.
- Any debris will be removed and cleared to ensure no risk of flooding. Any defects will be remediated.

7.0 SITE PHOTOGRAPHS

Refer to proposed Construction Detail/Existing Watercourse Location Site Photographs drawing ref: C1294/OWC/0001 included within Appendix 1 of this OWC Application.



Plate no.1 – Location A, looking south.



Plate no.2 – Location B, looking north.



Plate no.3 – Location C, looking south.



Plate no.4 – Location D, looking north.



Plate no.5 – Location E, looking north.



Plate no.6 – Location F, looking south.



Plate no.7 – Location G, looking northeast.



Plate no.8 – Location H, looking north.



Plate no.9 – Location I, looking east.



Plate no.10 – Location J, looking east.



Plate no.11 – Location K, looking north.



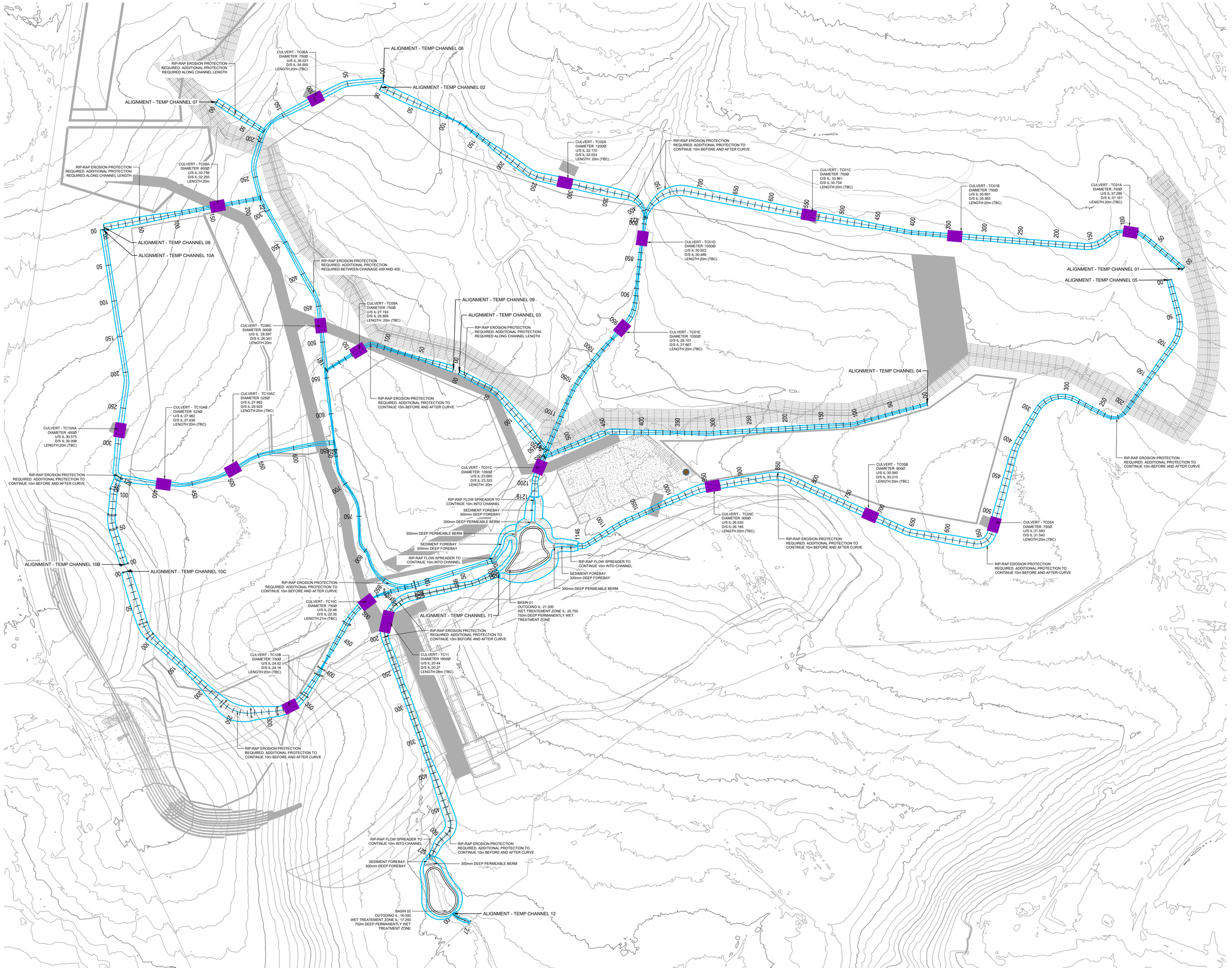
Plate no.12 – Location L, looking south.



Plate no.13 – Location M, looking south.

APPENDIX 1 - DESIGN DRAWINGS

Temporary Drainage General Arrangement – B038779/TTE/00/XX/DR/C/0500
Temporary Drainage Long Section 1 of 2 - B038779/TTE/00/XX/DR/C/0501
Temporary Drainage Long Section 2 of 2 - B038779/TE/00/XX/DR/C/0502
Open Channel Details - B038779/TE/00/XX/DR/C/0551
Basin Details - B038779/TE/00/XX/DR/C/0552
Culverted Crossing Details - B038779/TE/00/XX/DR/C/0553
Channel Schedules - B038779/TE/00/XX/DR/C/0560
Construction Detail/Existing Watercourse Location Site Photographs - C1294/OWC/0001



NOTES

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5. LAND DRAINAGE CONSENT WITH THE LLFA MAY BE REQUIRED WHERE WORKS ARE UNDERTAKEN WITHIN ORDINARY WATERCOURSES.
6. THIS DRAWING IS FOR INFORMATION ONLY.

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Rev	Description	Date	Drn	Chk	App
P06	CULVERT TC11 UPDTED	02.02.2023	MF	NT	AJ
P05	CULVERTS UPDATED	23.01.2023	MF	NT	AJ
P04	CHANNEL LINES UPDATED AND 11 ALIGMENT UPDATED TO CLIENTS COMMENTS	22.11.22	MF	NT	RC
P03	CHANNEL 10C AND 11 ALIGNMENT UPDATED TO CLIENTS COMMENTS	16.08.22	NT	AJ	AJ
P02	BASIN INFORMATION ADDED	04.08.22	NT	AJ	AJ
P01	PRELIMINARY FIRST ISSUE	01.08.22	JT	NT	AJ

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Project Name

HAVANT THICKET RESERVOIR

Sheet Title

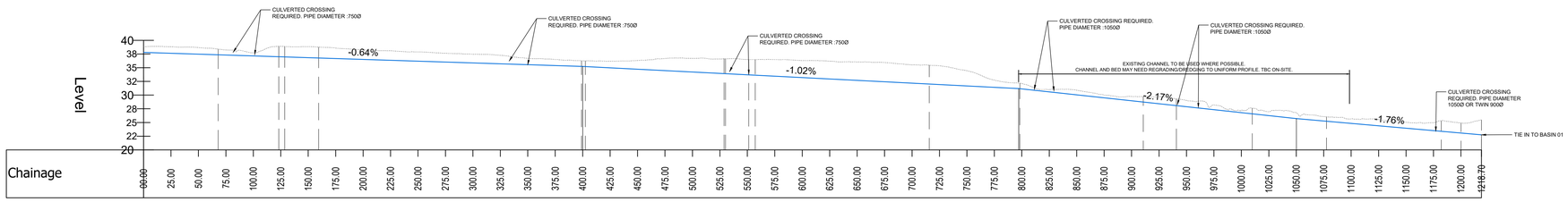
TEMPORARY DRAINAGE GENERAL ARRANGEMENT

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Suitability
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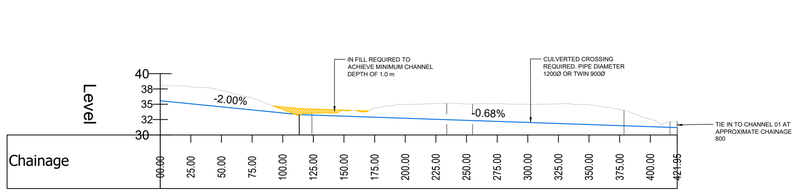
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B038779	TTE	00	XX	DR	C	0500	P06

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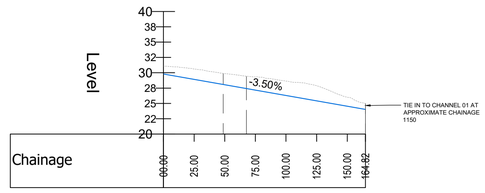
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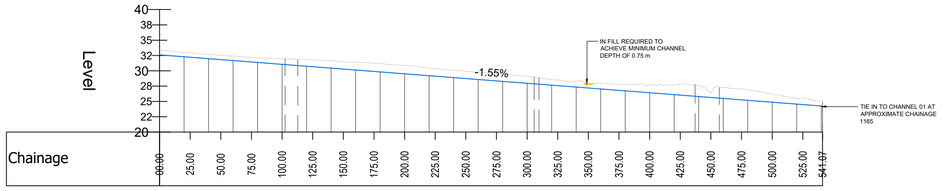
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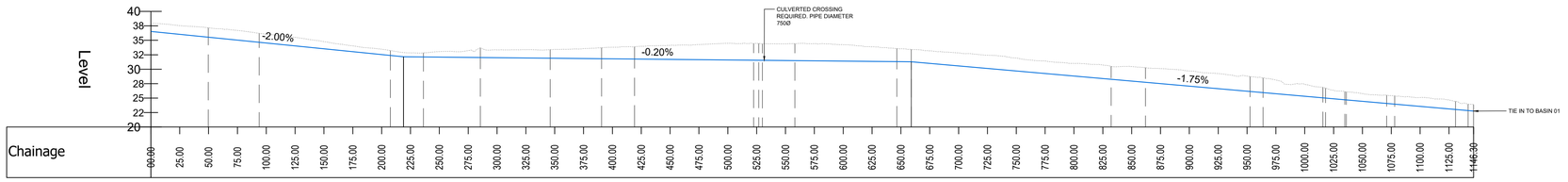
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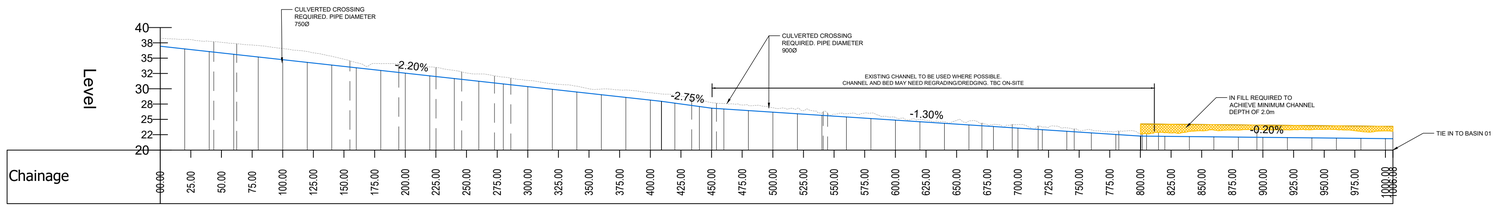
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ALIGNMENT - TEMP CHANNEL 04 - LONGSECTION
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ALIGNMENT - TEMP CHANNEL 05 - LONGSECTION
SCALE: H 1:2500,V 1:500. DATUM: 20.000



ALIGNMENT - TEMP CHANNEL 06 - LONGSECTION
SCALE: H 1:2500,V 1:500. DATUM: 20.000

NOTES

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P04	CULVERTS LOCATIONS UPDATED	02.02.2023	MF	NT	AJ
P03	CHANNEL 10C AND 11 ALIGNMENTS UPDATED TO SUIT CLIENT COMMENTS	16.08.2022	NT	AJ	AJ
P02	NOTES UPDATED	04.08.2022	NT	AJ	AJ
P01	PRELIMINARY FIRST ISSUE	01.08.2022	JT	NT	AJ

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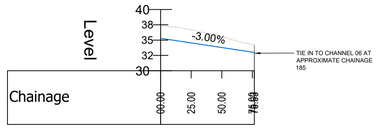
TEMPORARY DRAINAGE - LONG SECTIONS
SHEET 1 OF 2

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Suitability
B038779	JT	JUL 22	NT	JUL 22	AJ	JUL 22	AS SHOWN	S1

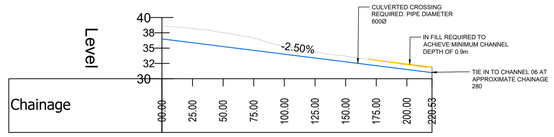
Client Project Number	Originator	Volume/System	Level/Location	Type/Code	Role	Number	Revision
B038779 - TTE	- 00	- XX		- DR	- C	- 0501	P04

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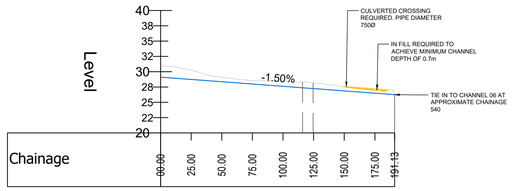
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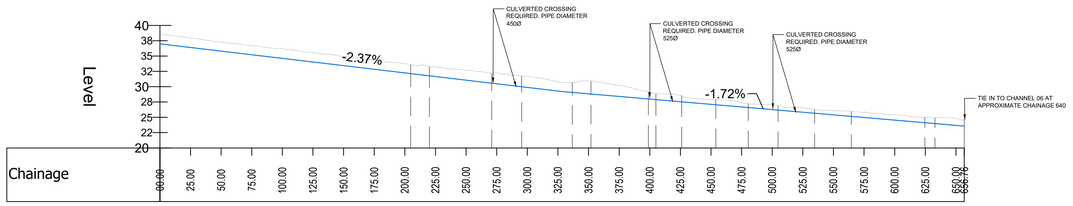
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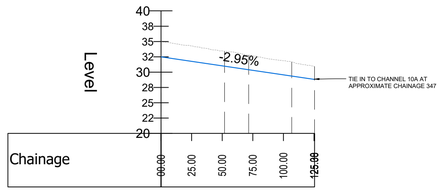
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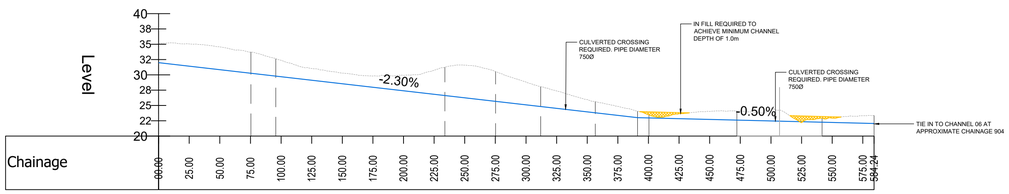
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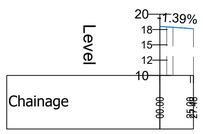
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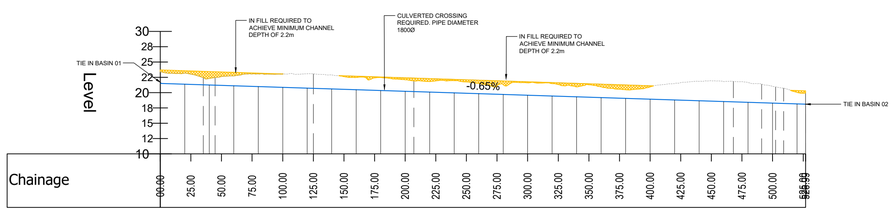
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ALIGNMENT - TEMP CHANNEL 10C - LONGSECTION
SCALE: H 1:2500,V 1:500. DATUM: 20.000



ALIGNMENT - TEMP CHANNEL 12 - LONGSECTION
SCALE: H 1:2500,V 1:500. DATUM: 10.000



ALIGNMENT - TEMP CHANNEL 11 - LONGSECTION
SCALE: H 1:2500,V 1:500. DATUM: 10.000

0 10 20 30 40 50 mm
SCALE 1:1

NOTES

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P04	CULVERTS LOCATIONS UPDATED	02.02.2023	MF	NT	AJ
P03	CHANNEL 10C AND 11 ALIGNMENTS UPDATED TO CLIENT COMMENTS	16.08.2022	NT	AJ	AJ
P02	CHANNEL 11 AND 12 UPDATE TO SUIT BASIN 02	04.08.2022	NT	AJ	AJ
P01	PRELIMINARY FIRST ISSUE	01.08.2022	JT	NT	AJ

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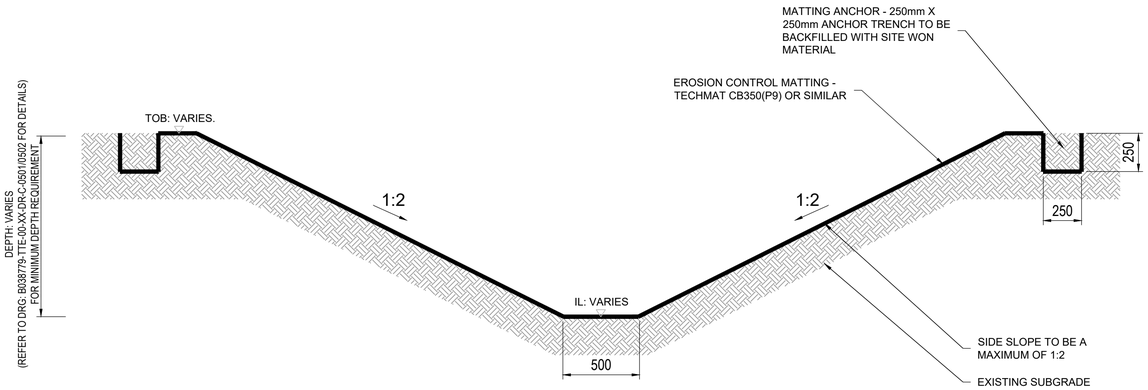
Project Name
HAVANT THICKET RESERVOIR

Sheet Title
TEMPORARY DRAINAGE - LONG SECTIONS
SHEET 2 OF 2

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Suitability
B038779	JT	JUL 22	NT	JUL 22	AJ	JUL 22	AS SHOWN	S1

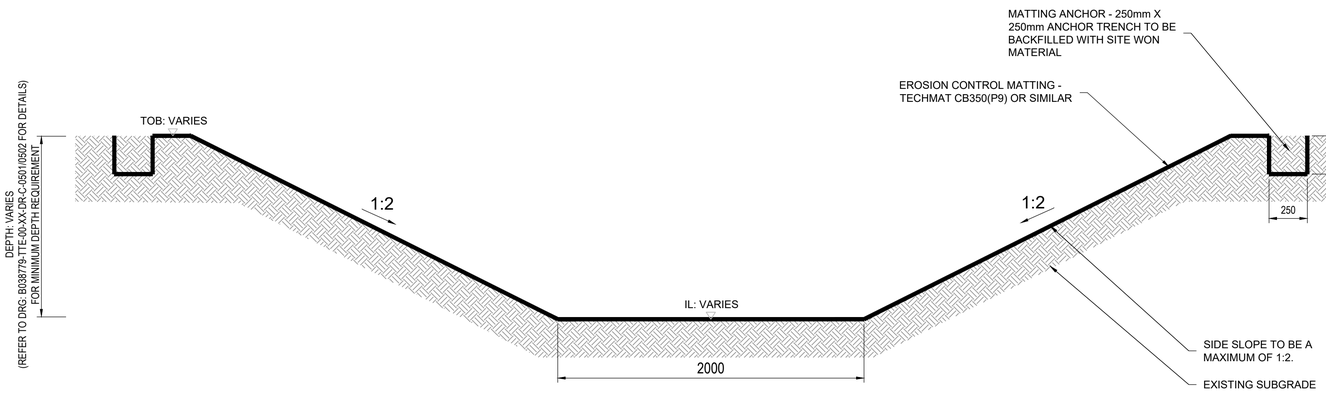
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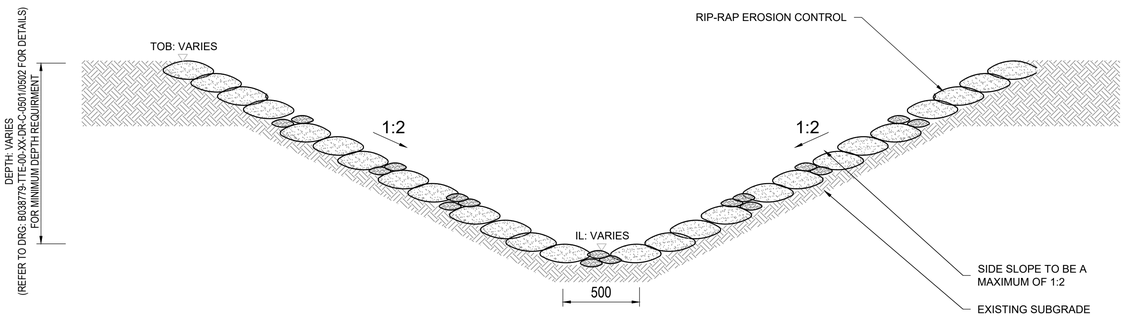
TYPICAL OPEN CHANNEL DETAIL (0.5m BASE WIDTH)

(SCALE 1:20)



CHANNEL 11 AND 12 DETAIL (2.0m BASE WIDTH)

(SCALE 1:20)



TYPICAL OPEN CHANNEL DETAIL (WITH ADDITIONAL EROSION PROTECTION)

(SCALE 1:20)

0 200 400 600 800 1000 mm

SCALE 1:20

NOTES

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Rev	Description	Date	Drn	Chk	App
P03	DETAILS UPDATED TO CLIENT COMMENTS	02.02.2023	NT	AJ	AJ
P02	NOTES AND DETAILS UPDATED	04.08.2022	NT	AJ	AJ
P01	PRELIMINARY FIRST ISSUE	01.08.2022	NT	AJ	AJ

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OPEN CHANNEL DETAILS

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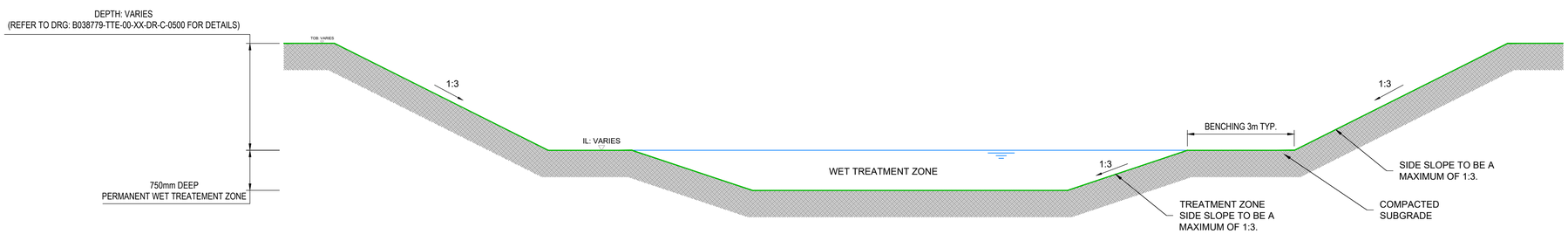
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TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Status
B038779	NT	JULY '22	AJ	JULY '22	AJ	JULY'22	As Shown	S1

Client Project Number	Originator	Function	Spatial	Form	Role	Number	Revision
B038779	- TTE -	00 -	XX -	DR -	C -	0551	P02

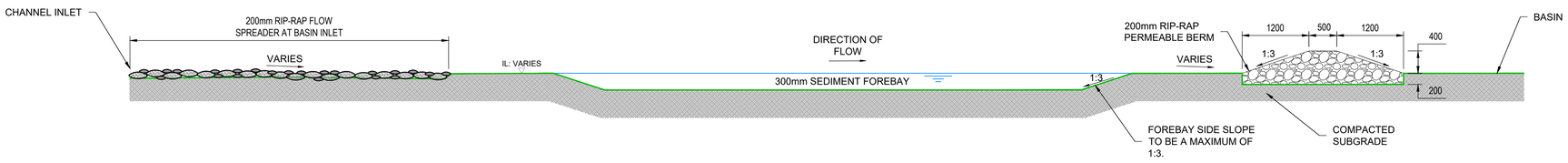
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TYPICAL BASIN DETAIL
(WITH WET TREATMENT ZONE)

(SCALE 1:50)



TYPICAL BASIN INLET AND SEDIMENT FOREBAY DETAIL

(SCALE 1:50)

0 200 400 600 800 1000 mm

SCALE 1:20

NOTES

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p02	UPDATED TO SUIT CLIENT COMMENTS	02.02.2023	NT	AJ	AJ
P01	PRELIMINARY FIRST ISSUE	04.08.2022	NT	AJ	AJ

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Project Name

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Sheet Title

BASIN DETAILS

Model Reference

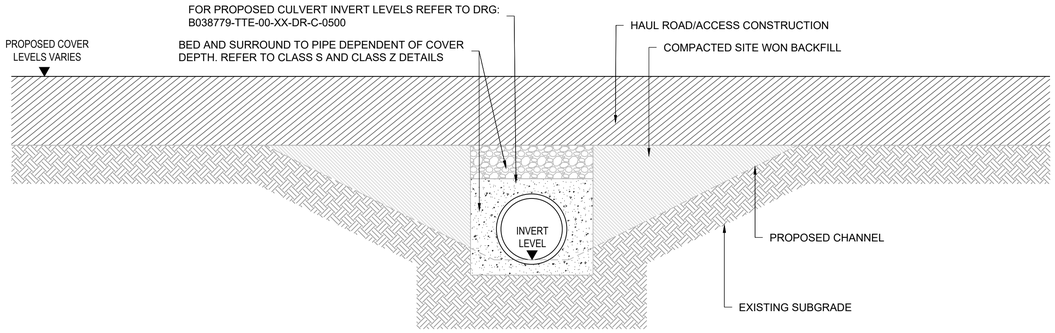
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TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Status
B038779	NT	JULY '22	AJ	JULY '22	AJ	JULY'22	As Shown	S1

Client Project Number	Originator	Function	Spatial	Form	Role	Number	Revision
B038779	- TTE -	00 -	XX -	DR -	C -	0552	P02

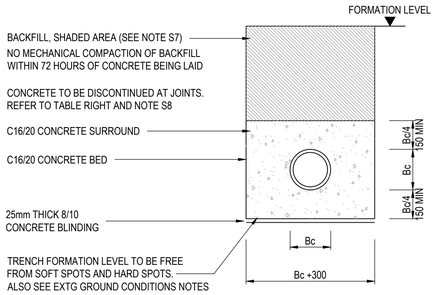
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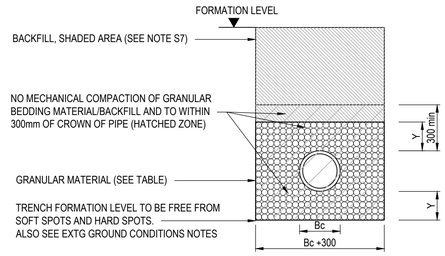
TYPICAL CULVERTED CROSSING DETAIL

(SCALE 1:50)



CLASS Z DETAIL (COVER TO PIPE LESS THAN 1.2m)

(SEE NOTE S4)



CLASS S DETAIL (COVER TO PIPE GREATER THAN 1.2m)

(SEE NOTE S4)

NOMINAL PIPE DIA (mm)	THICKNESS OF COMPRESSIBLE FILLER (mm)
LESS THAN 450	18
450 TO 1200	36
GREATER THAN 1200	54

COMPRESSIBLE FILLER TABLE

(BITUMEN IMPREGNATED INSULATING BOARD TO BS EN 120 AND BS EN 317)

NOMINAL PIPE DIA (mm)	SINGLE SIZED (mm)	GRADED (mm)
150	10 OR 14	14 TO 5
200 TO 300	10, 14 OR 20	14 TO 5 OR 20 TO 5
375 TO 525	14 OR 20	14 TO 5 OR 20 TO 5
GREATER THAN 525	14, 20 OR 40	14 TO 5, 20 TO 5 OR 40 TO 5

GRANULAR BEDDING MATERIAL

(AGGREGATES TO BS EN 12620:2002, AIR COOLED BLAST FURNACE SLAG TO BS 6543 AND LIGHTWEIGHT AGGREGATE TO BS EN 13055-1:2016)
(SEE NOTE S5)

SPECIFICATION NOTES

S1. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS 4027, UNLESS AGREED OTHERWISE WITH THE ADOPTING AUTHORITY.

S2. PRECAST CONCRETE PRODUCTS COMPLY WITH THE RELEVANT PROVISIONS OF BS 5911 AND BE KITEMARKED. CONCRETE PIPES ARE CLASS 120.

S3.. VITRIFIED CLAY PIPES AND FITTINGS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295 AND BE KITEMARKED. PIPE CRUSHING STRENGTH CLASS 200. IN AGGRESSIVE ENVIRONMENTS CAREFUL CONSIDERATION GIVEN TO JOINTING SYSTEM.

S4. CLASS Z OR CONCRETE SLAB PROTECTION DETAIL PROVIDED WHERE COVER TO THE PIPE BARREL IS LESS THAN 1.2m IN VEHICULAR TRAFFICKED AREAS AND 0.9m ELSEWHERE, TO ALL ROAD GULLY CONNECTIONS AND WITHIN AREAS OF DEEP ROOTING VEGETATION. WHERE CLASS Z TRENCH BEDDING DETAIL IS USED, THE CONCRETE BED AND SURROUND DISCONTINUED AT EACH PIPE JOINT OVER THE FULL CROSS SECTION BY MEANS OF A SHAPED COMPRESSIBLE FILLER. (SEE TABLE).

S5. GRANULAR TYPE 1 SUB BASE IN ACCORDANCE WITH CL. 803 OF Dtp SPECIFICATION FOR HIGHWAY WORKS 2006 AND LAID IN ACCORDANCE WITH CL. 802. NO MECHANICAL COMPACTION WITHIN 300mm OF CROWN OF PIPE. GRANULAR TYPE 1 SUB BASE WITHIN 300mm OF CROWN OF PIPE 40mm DOWN. LIMESTONE AGGREGATE NOT PERMITTED IF A PH OF 6 OR LESS IS LIKELY OR GROUNDWATER IS PRESNT.

S6. SELECTED EXCAVATED MATERIAL OF A UNIFORM NATURE FREE FROM STONES LARGER THAN 37.5mm, CLAY LUMPS LARGER THAN 75mm, TREE ROOTS, ORGANIC MATTER AND FROZEN SOIL (REFER TO CESSWI CLAUSE 2.49). MECHANICALLY COMPACTED SELECTED EXCAVATED MATERIAL COMPACTED IN LAYERS WITH A VIBRATORY ROLLER COMPLYING WITH METHOD 2 OF TABLE 6/4 OF Dtp SPECIFICATION FOR HIGHWAY WORKS 2006.

S7. BACKFILL IN PROPOSED TRAFFICKED AREAS:-
TYPE 1 AS NOTE S5.
BACKFILL IN NON-TRAFFICKED EXTERNAL AREAS:-
SELECTED EXCAVATED MATERIAL AS NOTE S6, IF REGARDED AS SUITABLE BY THE CONTRACT ADMINISTRATOR.

S8. THIS DRAWING TO BE READ IN ACCORDANCE WITH ALL OTHER RELEVANT TTE DRAWINGS, THIRD PARTY DRAWINGS, SPECIFICATIONS AND OTHER SUPPORTING DOCUMENTATION.

NOTES

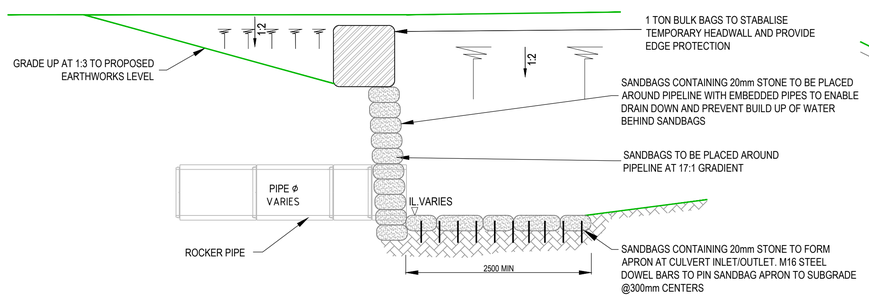
A) Bc = OUTSIDE DIAMETER OF PIPE BARREL.

B) DIMENSION Y:-
SLEEVE JOINTED PIPES, MIN. 150mm OR 1/4Bc, WHICHEVER IS THE GREATER. SOCKETED PIPE, MIN. 200mm OR 1/4Bc, WHICHEVER IS THE GREATER UNDER BARRELS AND NOT LESS THAN 150mm UNDER/OVER SOCKETS.

NOMINAL PIPE DIA (mm)	MAXIMUM WIDTH (mm)
100	600
150	700
225	800
300	900
375	1050
450	1150
525	1200
600	1350
675	1450

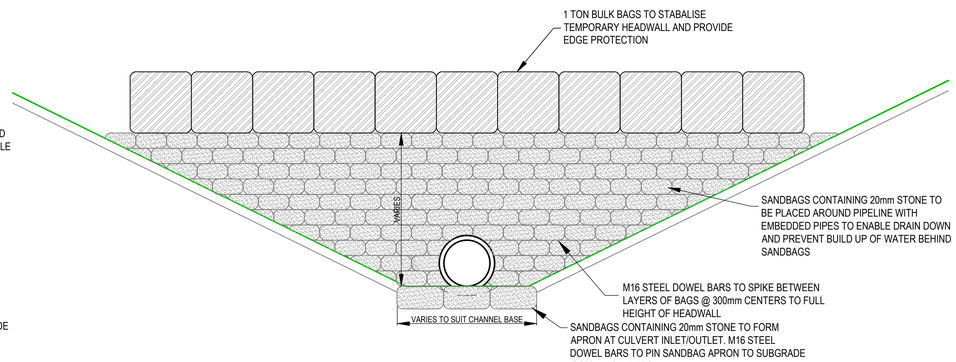
MAXIMUM TRENCH WIDTHS (EXCEEDANCE COULD COMPROMISE STRUCTURAL DESIGN OF PIPELINE)

RIGID PIPE TRENCH BEDDING DETAILS



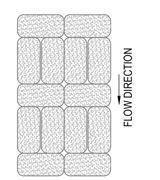
TEMPORARY HEADWALL DETAIL SECTION

SCALE 1:50



TEMPORARY HEADWALL DETAIL ELEVATION

SCALE 1:50



SANDBAG APRON LAYING PATTERN

SCALE 1:50

0 200 400 600 800 1000 mm

SCALE 1:20

NOTES

1) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

NOTES RE EXTG GROUND CONDITIONS

G1. MADE GROUND REMOVED DOWN TO VIRGIN GROUND, OR AS DIRECTED BY THE CONTRACT ADMINISTRATOR.

G2. THE CONTRACTOR HAS ALLOWED FOR ALL COSTS ASSOCIATED WITH THE DISPOSAL OF ANY MATERIALS ENCOUNTERED THAT REQUIRE SPECIAL DISPOSAL ARRANGEMENTS ON ACCOUNT OF THEIR CLASSIFICATION IN ACCORDANCE WITH THE LAND FILL DIRECTIVE AND ANY ASSOCIATED LEGISLATION.

G3. ALL MATERIAL IMPORTED TO SITE FOR BACKFILLING PURPOSES CLASSIFIED AS INERT FILL IN ACCORDANCE WITH THE WASTE ACCEPTANCE CRITERIA.

G4. FORMATION LEVEL FOR PIPE TRENCHES ARE STABLE AND OF A UNIFORM NATURE FREE FROM SOFT SPOTS AND HARD SPOTS. IN PEAT OR COHESIVE MATERIALS, A HAND SHEAR VANE TEST GIVING A RESULT LESS THAN 40 KPA WOULD INDICATE A SOFT SPOT. AREAS OF LOOSE OR VERY LOOSE GRANULAR MATERIALS ARE NOT CLASSIFIED AS SOFT SPOTS. BLINDING CONCRETE AND/OR STONE MAY BE USED AS DETERMINED ON SITE TO REINSTATE TRENCH TO FORMATION LEVEL.

G5. WHERE SIGNIFICANT EXCAVATION IS REQUIRED FOR SOFT SPOTS, FILL MATERIAL PLACED AND COMPACTED IN LAYERS (SOMETIMES REFFERED TO AS SOFT GROUND DETAIL).

G6. EXAMPLES OF BAD GROUND COULD BE PEAT, RUNNING SAND, MARSHY GROUND AND SOFT CLAY OR SILTY MATERIAL. THIS IS NOT AN EXHAUSTIVE LIST.ANY GROUND CONDITIONS RESULTING IN THE POSSIBILITY OF FINE MATERIALS ENTERING THE VOIDED GRANULAR MATERIAL SURROUNDING THE PIPE COULD BE CONSIDERED AS BAD GROUND CONDITIONS.
IF THE WORKS ARE CONSTRUCTED BELOW NORMAL GROUND WATER THIS COULD BE CONSIDERED AS BAD GROUND CONDITIONS.
IN BAD GROUND CONDITIONS WRAPPING THE GRANULAR MATERIAL SURROUNDING THE PIPE WITH GEOTEXTILE TO BE CONSIDERED.
IN PARTICULARLY BAD GROUND THE DETAILS SHOWN ON THIS DRAWING MAY NOT BE SUITABLE

G7. EXAMPLES OF UNUSUAL GROUND CONDITIONS COULD BE ROCK, FISSURED ROCK, LANDFILL SITES, GEOLOGICAL FAULTS OR MINING SUBSIDENCE.
THIS IS NOT AN EXHAUSTIVE LIST. THE DETAILS SHOWN ON THIS DRAWING MAY NOT BE SUITABLE FOR THESE CONDITIONS.

FOR INFORMATION ONLY

Rev	Description	Date	Drn	Chk	App
P03	SANDBAG APRON TO HEADWALL UPDATED	02.02.2023	MF	NT	AJ
P02	DETAILS UPDATED TO CLIENT COMMENTS	02.02.2023	MF	NT	AJ
P01	PRELIMINARY FIRST ISSUE	24.01.2023	MF	NT	AJ

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Client
JONES BROS

Project Name
HAVANT THICKET RESERVOIR

Sheet Title
CULVERTED CROSSING DETAILS

Model Reference
N/A

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Status
B038779	NT	Jan '23	AJ	Jan '23	AJ	Jan'23	As Shown	S1

Client Project Number	Originator	Function	Spatial	Form	Role	Number	Revision
B038779	- TTE -	00	- XX -	DR	- C -	0553	P03

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TTE_MT_v2

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 1	0.000	37.800	472385.451	109963.469	1.00	0.50	CH400-CH700 - TECHMAT CB350(P9) CH700-CH810 - RIP-RAP
	67.978	37.365	472332.971	110006.676	1.00	0.5	
	100.970	37.155	472307.511	110015.795	1.00	0.5	
	123.153	37.013	472282.067	110006.630	1.00	0.5	
	128.638	36.978	472277.839	110003.136	1.00	0.5	
	144.887	36.874	472264.361	109995.814	1.00	0.5	
	159.506	36.781	472249.118	109994.102	1.00	0.5	
	398.928	35.251	472010.484	110013.500	1.00	0.5	
	400.000	35.244	472009.416	110013.601	1.00	0.5	
	400.711	35.237	472008.712	110013.684	1.00	0.5	
	402.491	35.219	472006.949	110013.946	1.00	0.5	
	528.858	33.932	471882.409	110035.349	1.00	0.5	
	529.487	33.926	471881.788	110035.455	1.00	0.5	
	530.116	33.920	471881.168	110035.558	1.00	0.5	
	551.228	33.705	471860.339	110039.003	1.00	0.5	
	554.207	33.674	471857.403	110039.511	1.00	0.5	
	557.187	33.644	471854.476	110040.063	1.00	0.5	
	715.758	32.030	471698.870	110070.585	1.00	0.5	
	769.882	31.479	471659.736	110061.883	1.00	0.5	
	797.195	31.201	471639.705	110028.286	1.00	0.5	
	798.256	31.178	471639.573	110027.234	1.00	0.5	
	910.598	28.740	471626.735	109915.627	1.00	0.5	
	926.153	28.402	471622.795	109901.130	1.00	0.5	
	940.758	28.085	471614.727	109888.458	1.00	0.5	
	1009.917	26.584	471569.244	109836.360	1.00	0.5	
	1044.018	25.844	471549.092	109809.243	1.00	0.5	
	1050.126	25.711	471545.777	109803.781	1.05	0.5	
	1077.556	25.229	471533.437	109779.305	1.05	0.5	
	1182.109	23.393	471492.416	109683.135	1.05	0.5	
	1191.196	23.230	471489.618	109674.596	1.05	0.5	
	1200.102	23.077	471488.330	109665.704	1.05	0.5	
	1218.698	22.750	471487.264	109647.138	1.05	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Base width (m)
Temp Channel 2	0.000	35.572	471275.125	110214.710	1.00	0.5	CH000-CH370 - TECHMAT CB350(P9) CH370-CH422 - RIP-RAP
	113.508	33.302	471378.696	110168.266	1.00	0.5	
	118.703	33.267	471383.301	110165.907	1.00	0.5	
	123.861	33.232	471387.638	110163.085	1.00	0.5	
	233.922	32.482	471476.660	110098.366	1.00	0.5	
	244.569	32.409	471485.871	110093.062	1.00	0.5	
	254.903	32.339	471495.687	110089.896	1.00	0.5	
	378.548	31.497	471616.642	110064.241	1.00	0.5	
	400.275	31.349	471634.524	110052.751	1.00	0.5	
	416.156	31.240	471640.241	110038.133	1.00	0.5	
	421.953	31.201	471640.867	110032.370	1.00	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Base width (m)
Temp Channel 3	0.000	29.798	471383.575	109819.908	0.75	0.5	CH000-CH164.820 - RIP-RAP
	48.729	28.092	471426.692	109797.205	0.75	0.5	
	58.325	27.756	471434.703	109791.949	0.75	0.5	
	67.690	27.429	471441.415	109785.438	0.75	0.5	
	164.820	24.029	471504.500	109711.583	0.75	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Base width (m)
Temp Channel 4	0.000	32.610	472031.248	109776.290	0.75	0.5	CH000-CH536 - TECHMAT CB350(P9) CH536-CH541.070 - RIP-RAP
	102.458	31.024	471932.453	109749.135	0.75	0.5	
	107.646	30.944	471927.407	109748.024	0.75	0.5	
	112.797	30.864	471922.273	109747.441	0.75	0.5	
	305.700	27.879	471729.734	109735.590	0.75	0.5	
	307.694	27.848	471727.744	109735.508	0.75	0.5	
	309.685	27.817	471725.751	109735.504	0.75	0.5	
	437.054	25.846	471598.404	109737.826	0.75	0.5	
	447.115	25.690	471588.393	109736.999	0.75	0.5	
	456.912	25.538	471578.996	109734.287	0.75	0.5	
	541.070	24.236	471500.879	109702.976	0.75	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 5	0.000	36.538	472366.048	109948.048	0.70	0.5	CH000-CH1409 - TECHMAT CB350(P9) CH409-CH450 - RIP RAP CH810-CH910 - RIP-RAP
	49.797	35.542	472378.973	109899.957	0.70	0.5	
	73.414	35.069	472379.591	109876.568	0.70	0.5	
	93.925	34.659	472371.382	109857.928	0.70	0.5	
	207.583	32.386	472305.344	109765.423	0.70	0.5	
	218.998	32.158	472296.486	109758.470	0.70	0.5	
	225.004	32.146	472290.664	109757.107	0.70	0.5	
	236.247	32.123	472279.788	109759.325	0.70	0.5	
	285.502	32.025	472236.153	109782.173	0.70	0.5	
	323.292	31.949	472199.755	109782.536	0.70	0.5	
	346.062	31.903	472183.273	109767.273	0.70	0.5	
	390.590	31.814	472160.412	109729.062	0.70	0.5	
	404.970	31.786	472153.940	109716.234	0.70	0.5	
	419.155	31.757	472149.423	109702.800	0.70	0.5	
	522.412	31.551	472122.460	109603.125	0.70	0.5	
	524.591	31.546	472121.891	109601.022	0.70	0.5	
	526.767	31.542	472121.173	109598.965	0.70	0.5	
	530.035	31.536	472120.097	109595.880	0.70	0.5	
	546.953	31.502	472108.800	109583.966	0.70	0.5	
	558.119	31.479	472097.845	109582.757	0.70	0.5	
	646.459	31.303	472010.767	109597.638	0.70	0.5	
	652.767	31.290	472004.665	109599.079	0.70	0.5	
	659.007	31.303	471998.792	109601.273	1.10	0.5	
	832.248	28.246	471840.623	109671.948	1.10	0.5	
	847.550	27.978	471825.921	109675.972	1.10	0.5	
	861.947	27.726	471811.580	109675.544	1.10	0.5	
	952.543	26.141	471722.348	109659.881	1.10	0.5	
	958.242	26.041	471716.804	109658.578	1.10	0.5	
	963.891	25.942	471711.489	109656.673	1.10	0.5	
	1015.691	25.036	471663.792	109636.467	1.10	0.5	
	1016.872	25.015	471662.709	109635.996	1.10	0.5	
	1018.053	24.994	471661.636	109635.504	1.10	0.5	
	1034.766	24.702	471646.511	109628.391	1.10	0.5	
	1035.431	24.690	471645.910	109628.108	1.10	0.5	
	1036.096	24.679	471645.302	109627.838	1.10	0.5	
	1070.973	24.068	471613.424	109613.690	1.10	0.5	
	1074.457	24.007	471610.296	109612.169	1.10	0.5	
	1077.930	23.946	471607.281	109610.435	1.10	0.5	
	1130.643	23.024	471562.532	109582.575	1.10	0.5	
	1136.215	22.926	471557.456	109580.323	1.10	0.5	
	1141.512	22.834	471552.230	109579.555	1.10	0.5	
	1146.299	22.750	471547.443	109579.491	1.10	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 6	0.000	36.950	471278.759	110224.530	1.10	0.5	CH000-CH1409 - TECHMAT CB350(P9) CH409-CH450 - RIP RAP CH810-CH910 - RIP-RAP
	43.681	35.989	471235.273	110220.413	1.10	0.5	
	53.155	35.780	471225.982	110218.634	1.10	0.5	
	62.408	35.577	471217.389	110215.238	1.10	0.5	
	154.820	33.543	471134.953	110173.473	1.10	0.5	
	175.888	33.080	471118.687	110160.329	1.10	0.5	
	194.698	32.666	471109.848	110143.851	1.10	0.5	
	225.076	31.998	471100.746	110114.869	1.10	0.5	
	235.807	31.762	471099.158	110104.288	1.10	0.5	
	246.044	31.537	471100.311	110094.144	1.10	0.5	
	272.779	30.948	471106.694	110068.183	1.10	0.5	
	279.510	30.800	471108.736	110061.774	1.10	0.5	
	286.161	30.654	471111.580	110055.767	1.10	0.5	
	409.160	27.948	471171.490	109948.345	1.10	0.5	
	433.797	27.270	471183.491	109926.828	1.10	0.5	
	444.022	26.989	471187.526	109917.453	1.10	0.5	
	450.158	26.821	471189.001	10991.500	1.50	0.5	
	453.968	26.771	471189.546	109907.730	1.50	0.5	
	541.091	25.638	471198.704	109821.090	1.50	0.5	
	542.901	25.615	471198.927	109819.294	1.50	0.5	
	544.709	25.591	471199.214	109817.509	1.50	0.5	
	670.616	23.955	471214.360	109692.516	1.50	0.5	
	683.290	23.790	471217.454	109680.261	1.50	0.5	
	695.441	23.632	471223.218	109669.598	1.50	0.5	
	716.605	23.357	471235.465	109652.337	1.50	0.5	
	731.713	23.160	471242.227	109638.892	1.50	0.5	
	745.948	22.975	471244.663	109624.915	1.50	0.5	
	782.382	22.502	471245.765	109588.498	1.50	0.5	
	792.100	22.375	471248.361	109579.232	1.50	0.5	
	800.142	22.271	471253.611	109573.212	2.00	0.5	
	800.474	22.270	471253.877	109573.012	2.00	0.5	
	801.654	22.268	471254.825	109572.312	2.00	0.5	
	803.382	22.264	471256.013	109571.068	2.00	0.5	
	804.982	22.261	471256.676	109569.619	2.00	0.5	
	814.803	22.241	471259.287	109560.151	2.00	0.5	
	866.561	22.138	471294.317	109525.210	2.00	0.5	
	895.070	22.081	471322.437	109525.732	2.00	0.5	
	1006.079	21.859	471428.367	109558.923	2.00	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 7	0.000	35.296	471048.009	110194.323	1.17	0.5	CH000-CH76.533 RIP-RAP
	76.533	33.000	471113.041	110153.972	1.17	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 8	0.000	36.513	470892.053	110020.635	0.90	0.5	CH000-CH220.543 RIP-RAP
	220.534	31.000	471108.785	110061.409	0.90	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 9	0.000	29.120	471375.430	109824.559	0.70	0.5	CH000-CH109 - TECHMAT CB350(P9) CH109-CH129 - RIP RAP CH129-CH149 - CUVERT CH149-CH186 - TECHMAT CB350(P9) CH186-CH191.131
	116.013	27.380	471264.554	109858.696	0.70	0.5	
	120.522	27.312	471260.095	109859.023	0.70	0.5	
	124.485	27.253	471256.396	109857.671	0.70	0.5	
	191.131	26.253	471199.531	109822.916	0.70	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 10A	0.000	37.000	470890.294	110017.634	1.00	0.5	CH336-CH356 RIP-RAP CH651-CH656.758 RIP-RAP
	204.770	32.145	470922.660	109815.437	1.00	0.5	
	212.445	31.963	470923.288	109807.796	1.00	0.5	
	220.000	31.784	470922.757	109800.267	1.00	0.5	
	270.975	30.575	470915.543	109749.805	1.00	0.5	
	283.198	30.285	470913.521	109737.756	1.00	0.5	
	295.411	29.996	470911.919	109725.644	1.00	0.5	
	328.686	29.207	470908.964	109692.500	1.00	0.5	
	336.766	29.068	470908.246	109684.452	1.00	0.5	
	346.231	28.906	470911.664	109676.002	1.00	0.5	
	351.925	28.808	470916.773	109673.668	1.00	0.5	
	398.830	28.002	470963.194	109666.943	1.00	0.5	
	401.918	27.949	470966.256	109666.547	1.00	0.5	
	405.004	27.896	470969.327	109666.247	1.00	0.5	
	426.096	27.534	470990.349	109664.516	1.00	0.5	
	440.158	27.292	471004.394	109664.544	1.00	0.5	
	453.958	27.055	471017.983	109666.858	1.00	0.5	
	480.415	26.600	471043.609	109673.433	1.00	0.5	
	492.668	26.390	471055.213	109677.336	1.00	0.5	
	504.749	26.182	471065.974	109682.802	1.00	0.5	
	534.574	25.670	471091.521	109698.194	1.00	0.5	
	549.727	25.410	471105.136	109704.798	1.00	0.5	
	564.554	25.155	471119.398	109708.781	1.00	0.5	
	624.610	24.123	471178.444	109719.747	1.00	0.5	
	628.735	24.052	471182.514	109720.399	1.00	0.5	
	632.854	23.982	471186.610	109720.850	1.00	0.5	
	656.758	23.571	471210.428	109722.880	1.00	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 10B	0.000	32.500	470920.411	109554.089	2.00	0.5	CH120-CH125.379 RIP-RAP
	51.864	30.969	470904.865	109603.569	2.00	0.5	
	61.828	30.675	470902.842	109613.308	2.00	0.5	
	71.533	30.389	470902.764	109622.998	2.00	0.5	
	106.739	29.350	470905.833	109658.069	2.00	0.5	
	116.159	29.072	460908.399	109667.120	2.00	0.5	
	125.379	28.800	470912.440	109675.395	2.00	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 10C	0.000	32.000	470923.409	109544.549	1.00	0.5	CH220-CH290 RIP-RAP
	75.416	30.267	470946.015	109472.601	1.00	0.5	
	85.708	30.031	470950.085	109463.168	1.00	0.5	
	95.717	29.801	470955.812	109454.980	1.00	0.5	
	233.792	26.628	471057.375	109361.439	1.00	0.5	
	255.761	26.123	471076.237	109350.524	1.00	0.5	
	275.191	25.677	471095.426	109348.392	1.00	0.5	
	311.994	24.831	471132.101	109351.468	1.00	0.5	
	335.883	24.282	471154.543	109358.968	1.00	0.5	
	356.565	23.807	471169.310	109373.238	1.00	0.5	
	391.051	23.014	471188.660	109401.784	1.00	0.5	
	391.090	23.014	471188.682	109401.816	1.00	0.5	
	400.380	22.987	471192.846	109410.110	1.00	0.5	
	472.251	22.609	471227.866	109472.872	1.00	0.5	
	507.025	22.435	471250.192	109498.994	1.00	0.5	
	541.800	22.262	471281.227	109514.573	1.00	0.5	
	584.241	22.050	471322.188	109525.683	1.00	0.5	

Channel reference	Chainage (m)	Invert Level (m)	Easting (m)	Northing (m)	Minimum depth (m)	Base width (m)	Erosion protection
Temp Channel 11	0.000	21.500	471438.321	109543.030	2.20	2.00	CH110-CH210 RIP-RAP
	35.191	21.273	471405.883	109529.401	2.20	2.00	
	40.009	21.242	471401.360	109527.755	2.20	2.00	
	44.828	21.211	471396.695	109526.537	2.20	2.00	
	125.008	20.694	471318.210	109510.113	2.20	2.00	
	166.058	20.429	471285.830	109485.963	2.20	2.00	
	207.107	20.164	471282.810	109446.884	2.20	2.00	
	467.974	18.481	471370.778	109201.275	2.20	2.00	
	482.464	18.407	471371.416	109189.924	2.20	2.00	
	491.034	18.332	471365.760	109180.059	2.20	2.00	
	502.471	18.258	471357.481	109172.168	2.20	2.00	
	505.765	18.237	471355.301	109169.705	2.20	2.00	
	509.058	18.216	471353.538	109166.927	2.20	2.00	
	526.989	18.100	471345.265	109151.018	2.20	2.00	

NOTES

1. THIS DRAWING IS BASED ON TEMPORARY DRAINAGE SKETCH DRG: HTR WATER MANAGEMENT STRATEGY SKETCH 20220406 PROVIDED BY JONES BROS AND LIDAR INFORMATION PROVIDED BY THE ENIVIRONMENT AGENCY.
2. ALL EXISTING LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS. ANY VARIANCE TO THE EXISTING LEVELS ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
3. RIP-RAP EROSION PROTECTION IS REQUIRED WHERE FLOW VELOCITIES ARE ANTICIPATED TO BE GREATER THAN 1.4m/s.
4. TEMPORARY DRAINAGE WORKS AND OUTFALLS TO EXISTING WATERCOURSE SUBJECT TO AGREEMENT WITH THE ENVIRONMENT AGENCY.
5. LAND DRAINAGE CONSENT WITH THE LLFA MAY BE REQUIRED WHERE WORKS ARE UNDERTAKEN WITHIN ORDINARY WATERCOURSES.
6. THIS DRAWING IS FOR INFORMATION ONLY.

FOR INFORMATION ONLY

Rev	Description	Date	Drn	Chk	App
P03	EROSION PROTECTION ADDED	23.01.2023	MF	NT	AJ
P02	CHANNEL 10C AND 11 ALIGNMENTS UPDATED TO SUIT CLIENT COMMENTS	16.08.2022	JT	NT	AJ
P01	PRELIMINARY FIRST ISSUE	04.08.2022	JT	NT	AJ

Document Control

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www.tetratecheurope.com

Client

JONES BROS

Project Name

HAVANT THICKET RESERVOIR

Sheet Title

TEMPORARY DRAINAGE - CHANNEL SCHEDULES

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Suitability
B038779	JT	JUL 22	NT	JUL 22	AJ	JUL 22	N.T.S	S1

Client Project Number	Originator	Volume/System	Level/Location	Type/Code	Role	Number	Revision
B038779	TTE	00	XX	DR	C	0560	P03

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TTE_MT_v1

Legend:

- **D** — Image reference and location
- Proposed temporary drainage
- Proposed culvert for site access
- Existing watercourse alignment
- Proposed temporary settlement lagoons

StnMJJV6

StnMJJV5

StnMJJV7

StnMJJV8

StnMJJV9

StnMJJV4

StnMJJV3

StnMJJV2

StnMJJV1

A

B

C

D

E

F

G

H

I

J

K

L

M

CULVERT - TC07
DIAMETER :750Ø
U/S IL:34.0
D/S IL:34.0
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION REQUIRED ALONG CHANNEL LENGTH

ALIGNMENT - TEMP CHANNEL 06

ALIGNMENT - TEMP CHANN

ALIGNMENT - TEMP CHANNEL 07

CULVERT - TC06B
DIAMETER :750Ø
U/S IL:32.774
D/S IL:32.134
LENGTH:29m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION REQUIRED ALONG CHANNEL LENGTH

CULVERT - TC08A
DIAMETER :600Ø
U/S IL:32.756
D/S IL:32.255
LENGTH:20m

ALIGNMENT - TEMP CHANNEL 08

ALIGNMENT - TEMP CHANNEL 10A

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION REQUIRED BETWEEN CHAINAGE 409 AND 450.

CULVERT - TC06C
DIAMETER :900Ø
U/S IL:26.597
D/S IL:26.341
LENGTH:20m

CULVERT - TC09A
DIAMETER :750Ø
U/S IL:27.193
D/S IL:26.889
LENGTH: 20m (TBC)

ALIGNMENT - TEMP CHANNEL 09

ALIGNMENT - TEMP CHANNEL 03

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION REQUIRED ALONG CHANNEL LENGTH

CULVERT - TC01B
DIAMETER :1050Ø
U/S IL:24.975
D/S IL:24.039
LENGTH: 53m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC01C
DIAMETER :1050Ø
U/S IL:23.682
D/S IL:23.325
LENGTH: 20m

CULVERT - TC10A
DIAMETER :450Ø
U/S IL:30.575
D/S IL:30.098
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

ALIGNMENT - TEMP CHANNEL 10B

ALIGNMENT - TEMP CHANNEL 10C

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC10C
DIAMETER :750Ø
U/S IL:22.46
D/S IL:22.35
LENGTH:21m (TBC)

CULVERT - TC10B
DIAMETER :750Ø
U/S IL:24.62
D/S IL:24.16
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

RIP-RAP FLOW SPREADER TO CONTINUE 10m INTO CHANNEL

SEDIMENT FOREBAY. 300mm DEEP FOREBAY

300mm DEEP PERMEABLE BERM

BASIN 01
OUTGOING IL: 21.500
WET TREATEMENT ZONE IL: 20.750
750m DEEP PERMANENTLY WET TREATMENT ZONE

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC11
PCC BOX CULVERT:1500mm W X 1800mm H
U/S IL:20.44
D/S IL:20.27
LENGTH:28m (TBC)

ALIGNMENT - TEMP CHANNEL 11

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

RIP-RAP FLOW SPREADER TO CONTINUE 10m INTO CHANNEL

SEDIMENT FOREBAY. 300mm DEEP FOREBAY

300mm DEEP PERMEABLE BERM

BASIN 02
OUTGOING IL: 18.000
WET TREATEMENT ZONE IL: 17.250
750m DEEP PERMANENTLY WET TREATMENT ZONE

ALIGNMENT - TEMP CHANNEL 12

CULVERT - TC02A
DIAMETER :1200Ø
U/S IL:32.170
D/S IL:32.033
LENGTH: 20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC05C
DIAMETER :750Ø
U/S IL:25.010
D/S IL:24.659
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC21A
DIAMETER :750Ø
U/S IL: 33.861
D/S IL:33.754
LENGTH:20m (TBC)

ALIGNMENT - TEMP CHANNEL 04

ALIGNMENT - TEMP CHANNEL 01

ALIGNMENT - TEMP CHANNEL 05

CULVERT - TC05A
DIAMETER:600Ø
U/S IL:32.933
D/S IL:32.386
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

CULVERT - TC05B
DIAMETER :750Ø
U/S IL:31.583
D/S IL:31.542
LENGTH:20m (TBC)

RIP-RAP EROSION PROTECTION REQUIRED. ADDITIONAL PROTECTION TO CONTINUE 10m BEFORE AND AFTER CURVE

Rev	Date	Description	Drawn
I00	02/02/2023	First Issue	DRP

Project:	Havant Thickett Reservoir
Title:	Temporary drainage works
Scale:	1:5000@A3
Drawing No.	C1294_OWC_0001
Sheet No.	1 of 1
Drawn By:	DRP
Date:	02/02/2023
Version	I01

Future Water MJJV Ltd

Appendix 3 Ordinary Watercourse Consent Decision Notice

Hampshire County Council

Land Drainage Act 1991

Ordinary Watercourse Land Drainage Consent

To: Jones Bros (Ruthin) Civil Engineering Ltd
Ty Glyn Canol Y Dre
Ruthin
Denbighshire
LL15 1QW

Consent No: **OWC/2023/0082**

HCC Ref: HVOW045

For: Jones Bros (Ruthin) Civil Engineering Ltd

Date of Application: 13 March 2023

Hampshire County Council, as Lead Local Flood Authority in exercise of its powers under **Section 23** of the Land Drainage Act 1991, hereby grants its consent for the following works, in accordance with the plans and documents listed and subject to the attached conditions:

Description of works: **Temporary surface water drainage works prior to the construction of Havant Thicket Reservoir**

Location: **Havant Thicket Reservoir, Swanmore Road, Havant, Hampshire, PO9 4ET**

Map reference: **471604 109754**

Plans and documents: **HTR Phase 1 Ordinary Watercourse Consent Application FINAL 030223**

This consent shall come into effect on: 31 March 2023

All enquiries should be referred to the Universal Services,

The Castle, Winchester, SO23 8UD

Tel: (01962) 846730 Fax: (01962) 847055



Director of Universal Services

31 March 2023

Hampshire County Council

Land Drainage Act 1991

Ordinary Watercourse Land Drainage Consent

Consent No: **OWC/2023/0082**

Continued

Conditions

1. Written notification is to be provided no less than seven days before commencement of the consented works along with details of who will be undertaking regular maintenance (during and post construction) by completing the reply slip attached to the Decision Notice.

Guidance for working on watercourses

1. All works should be carried out to ensure **minimum obstruction to flows** in the watercourse at all times.

2. Under Regulations 12 and 38 of the Environmental Permitting (England and Wales) Regulations 2010 i**t is an offence if you cause or knowingly permit a discharge into a watercourse of poisonous, noxious or polluting matter**, of any waste matter or of any trade or sewage effluent other than under and in accordance with an environmental permit.

3. Attention should be given to **safety aspects when carrying out works** pursuant to this consent, as structures in watercourses can be a danger to members of the public.

4. On **completion of the works**, all debris and surplus material shall be removed from the banks of the watercourse(s) and any bank damage resulting directly or indirectly from the works is to be repaired

Informative

Hampshire County Council does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

The issue of a Land Drainage Consent by Hampshire County Council does not absolve a person proposing to execute works etc from the need to obtain any other permits, licences, consents, approvals or permissions. This includes Byelaw Consents or permissions (including planning permission), either from Hampshire County Council or other Bodies which may be required in law, or in order to comply with any duties and responsibilities for the protection of the environment. In addition, you should ensure that you obtain the consent of any owners or occupiers of land, as appropriate. This consent does not confer any rights of entry or rights over property.

Hampshire County Council

Land Drainage Act 1991

Ordinary Watercourse Land Drainage Consent

Consent No: **OWC/2023/0082**

Continued

Hampshire County Council Land Drainage Consents are required by virtue of the Land Drainage Act 1991. The following activities on an Ordinary (non-main) Watercourse require Local Authority Consent:

Under Section 23 of the Land Drainage Act 1991

- the erection or alteration of any mill dam, weir or other like obstruction to the flow of any watercourse
- the erection or alteration of any culvert that would be likely to affect the flow of any watercourse

Under Sections 17 and 20(2) of the Land Drainage Act 1991

- Any drainage works carried out by a local authority against flooding in connection with any watercourse

Under Section 61F Land Drainage Act 1991 (Inserted by Schedule 22 Environment Act 1995)

- the operation of any drainage works, under the control of any Internal Drainage Board or local authority, so as to manage the level of water in a watercourse for the purposes of facilitating spray irrigation.

Note: Consent under the above legislation is required irrespective of whether the works are permanent or temporary.

Contraventions

In relation to Ordinary Watercourses, the authority can under Section 24 of the Land Drainage Act 1991 serve a legal notice requiring the person to abate the nuisance within a specified time. Failure to abide by such a notice can result in the Hampshire County Council carrying out the necessary remedial work and seeking to recover costs.

Sale of land

It is strongly advised that the Ordinary Watercourse land drainage consent (or a copy of) is passed on to the new owners if the property/land is sold.

Ordinary Watercourse Land Drainage Consent

Reply Slip

Ordinary Watercourse Land Drainage Consent Number: OWC / ……..… / …….
(stated on Decision Notice)

Notification that works are scheduled to start on: .....…….
(at least 7 days before works are due to start)

Maintenance of the structure(s) during construction will be undertaken by:

Name of contractor: ……...

Telephone number: ……Email address: ……...

Maintenance of the structure(s) - post construction - will be undertaken by:

Name of Landowner or Management Company: ……...

……

Address:…….

……

……

Telephone Number(s): ……..……

Email Address: ……

Date: …….

Name: ……..…….. **Signature:** …….....

Please return this reply slip via email to owc@hants.gov.uk

Or post to: **Flood & Water Management**
Universal Services
Hampshire County Council
The Castle
Winchester
SO23 8UD