

Havant Thicket Reservoir

Water Quality Management Plan

Main Reservoir Works

15/03/2024 | Rev 03

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 Revision history

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1. Introduction

1. This Water Quality Management Plan (WQMP) describes the control measures that will be adopted by Future Water to protect water quality during the construction (main works) of Havant Thicket Reservoir. The WQMP has been developed in line with the requirements presented in the Outline Environmental Management Plan (OEMP) and the Register of Environmental Activities and Commitments (REAC). The WQMP forms part of the Construction Environmental Management Plan (CEMP) and the Environmental Management System (EMS).

Project location

2. Havant Thicket Reservoir (the Site) is located in a shallow valley located between Havant, Leigh Park, and Rowlands Castle, at National Grid Reference SU 715 097 (**Figure 1-1**). The Site has an area of approximately 140 hectares and originally comprised predominantly open grassland, with some woodland, hedgerows, and ditches. The Site was mostly utilised for animal grazing with public access via a bridleway, The Avenue, that traversed the middle of the Site, with permissive paths around most of the perimeter.
3. Planning permission for the construction of a reservoir was first granted in 1964, and the land was acquired by Portsmouth Water in two blocks in 1965 and 1966 for the purpose of constructing a new reservoir to help meet the rising demand for water. The Site lies within two local planning authorities, Havant Borough Council and East Hampshire District Council, within the county of Hampshire.
4. A pipeline route, connecting the Site to Portsmouth Water's pumping station located at Bedhampton Springs, is located within the planning boundary of Havant Borough Council. The pipeline is not part of Future Water works or included within this WQMP (**Figure 1-2**).

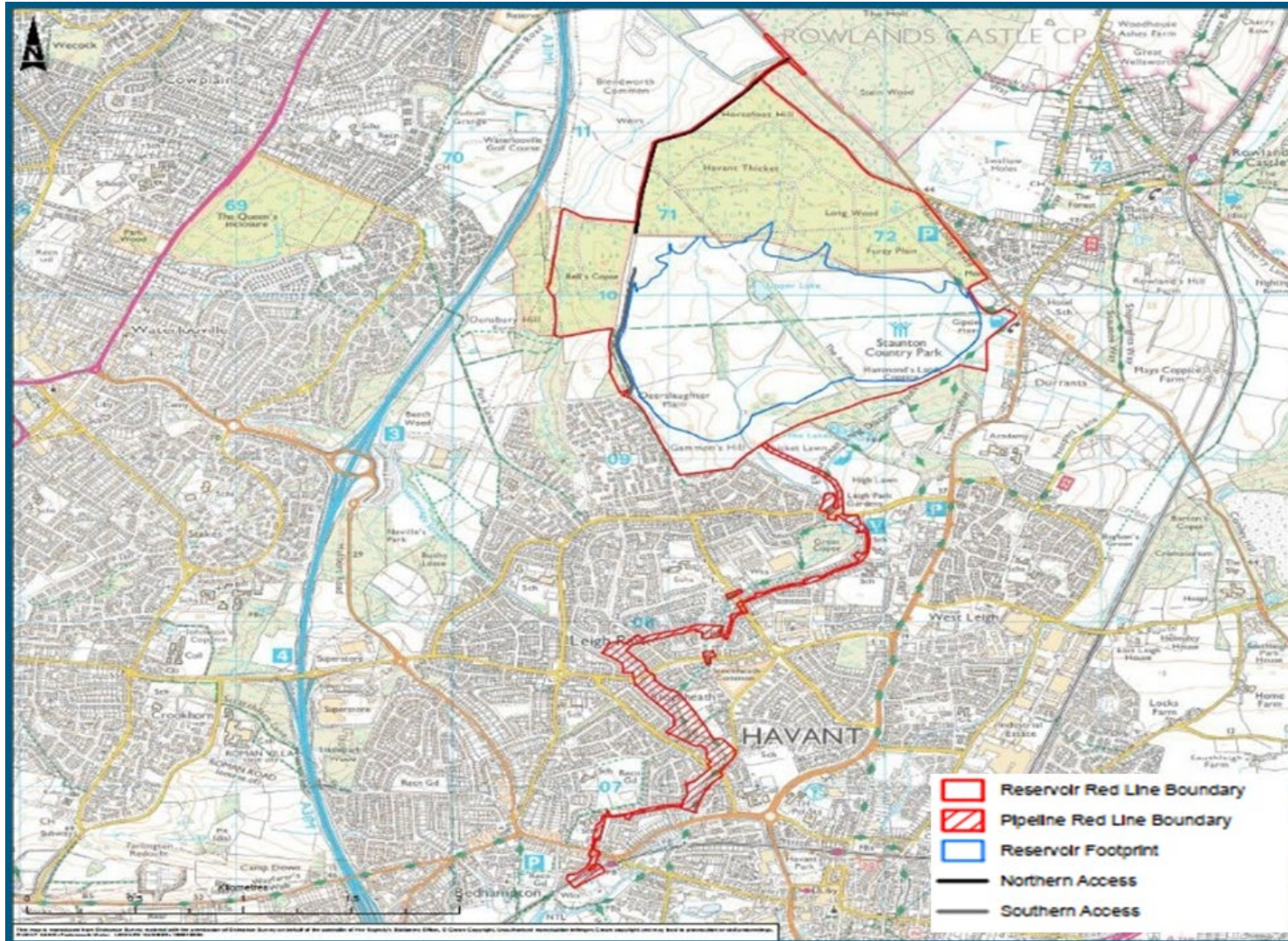
Hydrological setting

5. The central and western parts of the Site are drained by the Riders Lane Stream, which flows into the Hermitage Stream and subsequently Langstone Harbour. An area of the eastern part of the Site is drained by the Durrants Stream, which flows into the River Lavant (Hampshire) and subsequently Langstone Harbour. A third stream, Park Lane Stream, is located off-site, though close to the western boundary of the Site. Riders Lane, Durrants, and Park Lane Streams all form part of the Hermitage Stream river water body (GB107042016370)¹.

¹ <https://environment.data.gov.uk/catchment-planning/WaterBody/GB107042016370>

Figure 1-1 Havant Thicket Reservoir site (source: PC2625-RHD-ZZ-XX-DR-Z-0021)

Figure 1-2 Location of Havant Thicket Reservoir, Northern Access Road, and Pipeline (source: OS mapping)





Scheme overview

6. The Main Works will consist of 2.2 million m³ of earthworks over a period of three years excluding the filling period of the reservoir (wet commissioning). The key components of the overall Scheme are as follows:
 - A reservoir for raw water storage plus access routes, control house, visitor centre and car park, recreational facilities for public amenity and a wetland along the northern shore of the reservoir
 - Minor upgrades to the existing pumping arrangements at Bedhampton Springs and Farlington Water Treatment Works – outside the scope of this WQMP
7. The scope of the Main Works includes:
 - Construction of the reservoir earth embankment - borrow pit excavation, materials haulage, placement, and compaction of clay
 - Construction of the reservoir culvert – deliveries of concrete by drum mixer lorries with reinforced concrete structures cast on-site using formwork
 - Construction of the wetland earth embankments and control structures - stripping of topsoil and subsoil, excavation of clay from borrow pits, materials haulage, clay compaction using vibrating rollers, and the installation of control structures within the embankment to maintain the required water level
 - Construction of the valve tower - deliveries of concrete by drum mixer lorries with reinforced concrete structures cast on-site using formwork
 - Construction of the Southern Access Road – stripping of ground to formation level, placing and compaction of sub-base and drainage, final surface dressing
 - Construction of the control house and bi-directional pipe - deliveries of concrete by drum mixer lorries with reinforced concrete structures cast on-site using formwork, and installation of ground structures and pipework
 - Construction of the spillway - deliveries of concrete by drum mixer lorries with reinforced concrete structures cast on-site using formwork
 - Construction of the pedestrian footbridge – pre-cast concrete sections delivered to site on articulated lorry via the Northern Access Road, following construction of the main embankment and valve tower
 - Hard and soft landscaping - soft landscaping and aftercare, hard landscaping comprising fencing, walling and the Avenue staircase
 - Installation of Mechanical, Electrical, Instrumentation, Control and Automation (MEICA) and associated fit out of culvert - draw off, filling pipework and installation of associated systems within the embankment culvert and tower, and installation of security fencing, gates, doors, and barriers on control structures
8. To construct the main and wetland embankments, material will be excavated from the site via three borrow pits. The borrow pits will need to be dewatered due to the:
 - Infiltration of surface water runoff and/ or rainfall during the Main Works
 - Infiltration of groundwater from the underlying geology into the borrow pits

Management of water on site

9. Water from the following activities will be treated onsite and discharged into Riders Lane Stream:
 - a. Dewatering of the borrow pits

- b. Dewatering of the embankment ground improvements, engineering cutoffs and culvert dig and replace
 - c. Surface water runoff
10. A proportion of the water abstracted (dewatered) from the borrow pits will be stored on site prior to re-use for dust suppression and re-wetting of excavation faces, as authorised in the Abstraction Licence SO/042/0028/021:
 - a. Dust suppression – 200 m³/ day
 - b. Re-wetting of excavation faces – 100 m³/ day
11. Excess water, including surface water runoff, will be treated using polymer-based flocculants and settlement in a series of attenuation ponds prior to being pumped into the site's surface water drainage network and discharge off site.
12. The polymer-based flocculant will remove clay and silt particles, which due to their small particle size can remain in suspension rather than settling out. The methodology for this process is detailed in the Water Treatment Management Plan (WTMP) (Frog Environmental, ref. FROG/HTR/WTP01, September 2023, **Appendix A**).
13. The scope and design philosophy of the surface water drainage network and attenuation ponds is detailed in the Hydraulic Modelling Technical Note (TetraTech, ref. 784-B038779, October 2022).
14. No discharges of abstracted water will be made to the Durrants or Park Lane Streams.

Structure of the Water Quality Management Plan

15. The WQMP is a live document applicable to the Main Works only until the planned completion; approximately December 2028. The WQMP adheres to the latest Environment Agency Management System guidance², and describes the controls that will be adopted to manage and control environmental risks during the construction works:
 - Water Quality Monitoring (**Section 2**)
 - Water Quality Management Measures (**Section 3**)
 - Contingency and Accident Plans (**Section 4**)
 - Document Management System (**Section 5**)

Relevant Legislation and Environmental Permits

16. The Main Works will comply with relevant legislation including:
 - The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154) as amended
 - The Land Drainage Act 1991 (SI 1991/59)
 - The Water Resources Act 1991 (SI 1991/57)
 - Water Abstraction and Impounding (Exemptions) Regulations 2017 (SI 2017/1044)
 - Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (SI 2015/1623)
17. Future Water will obtain the necessary Environmental Consents, Licences and Permits that authorise the construction of Havant Thicket Reservoir. These are recorded in the Consents Register (HTR-RHD-ZZ-ZZ-RE-Y-0002) and summarised in **Table 1**.

² <https://www.gov.uk/guidance/develop-a-management-system-environmental-permits>

Table 1 Summary of Environmental Consents, Licences and Permits required for the construction of Havant Thicket Reservoir

Consent, Licence, Permit	Ref. Number	Status	Date Granted	Regulator	Purpose
Abstraction Licence	SO/042/0028/021	Determined Variation in preparation	20/12/2023	Environment Agency	Abstraction of groundwater from the Harwich formation
Abstraction Licence	tbc	Submitted to the EA 13 March 2024	Not yet granted	Environment Agency	Abstraction of groundwater from the Bognor formation
Environmental Permit	EPR/ZB3596EZ	In determination	Not yet granted	Environment Agency	Treatment and discharge of water from abstraction activities
Environmental Permit	EPR/JB3651TP	Submitted to the EA 4 March 2024	Not yet granted	Environment Agency	Treatment and discharge of surface water runoff & vehicle washing
Environmental Permit	tbc	In preparation	Not yet granted	Environment Agency	Treatment and discharge of water from abstraction activities

Project Commitments and Relevant Guidance

18. Additionally, a REAC Register has been developed as part of the Environmental Statement that states the best practice measures to be adopted to prevent the pollution of watercourses. The specific water quality REAC commitments are presented in **Appendix B**, and include, but are not limited to, the following guidance (**paragraph 44**):

- Guidelines for Pollution Prevention (GPP)³
- Construction Industry Research and Information Associated (CIRIA)

19. Although the GPP was formally withdrawn by the Environment Agency (December 2015), it remains valid guidance in Scotland and Northern Ireland and continues to represent a robust approach to environmental management on construction sites to reduce the probability and impact of leaks and spills and managing pollution incidents.

³ <https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/>

2. Water Quality Monitoring Plan

Monitoring Requirements

20. This section describes the water quality monitoring requirements for the Main Works, as per REAC W3 (**Appendix B**), which states:

“A water quality monitoring plan will be included in the CEMP, discussed, and agreed with the Environment Agency. This will make provision for the parameters to be monitored, sample locations, frequency, and duration of monitoring. This will include who should undertake sampling, any requirements for visual checks, inclusion of additional monitoring points as part of baseline monitoring, sampling/ laboratory analysis accreditation requirements.

The plan should make provision for continuous flow and water quality monitoring in downstream watercourses as well as visual daily monitoring be undertaken to ensure that the discharge does not result in any scouring of the beds and banks or churn up of silts from the riverbed.”

21. Visual monitoring will also be used to detect the presence of oils. Any observed sheen on the water’s surface requires an immediate response, e.g., source isolation, use of spill kits and absorbent booms, and if necessary, via the on-call emergency contractor (Adler and Allan).
22. In addition, the following documents, produced by Atkins on behalf of Portsmouth Water Ltd, identify relevant monitoring requirements:
- Havant Thicket Winter Storage Reservoir Project, Geology and Hydrogeology Desk Study Phase 1a (reference HTR-ATK-ZZ-ZZ-RP-C-0004, January 2020, rev C01)
 - Havant Thicket Reservoir Project, Environmental Statement Volume 4 – Appendix A10 Ground Conditions, A10.5 Havant Thicket Reservoir Winter Storage Reservoir, Ground Investigation Report (reference HTR-ATK-RZ-RE-RP-C-0001, 20th April 2020, rev C01)
 - Havant Thicket Reservoir Project, Environmental Statement Volume 2 – Main Report Chapter 10 Ground Conditions (reference HTR-ATK-ZZ-ZZ-RP-Z-0110, August 2020, rev C03)
 - Havant Thicket Reservoir Project, Environmental Statement Volume 4 – Appendix A2 Description of the Development, A2.1 Outline Environmental Management Plan (OEMP) (reference HTR-ATK-XX-XX-RP-Z-0069, 8th September 2020, rev C02)
 - Havant Thicket Reservoir Project, Environmental Statement Volume 2 – Main Report Chapter 15 Water (reference HTR-ATK-ZZ-ZZ-RP-Z-0115, September 2020, rev C03)
23. A review of the above documents (**paragraph 22**) identified the following risks and monitoring requirements:
- Continuous monitoring point required downstream of the proposed reservoir
 - Elevated concentrations of ammoniacal nitrogen were identified in groundwater samples⁴
 - Risk of suspended solids entering watercourses from run off and construction activities
 - Spillages from construction plant and other activities resulting in oils, chemicals and other potential pollutants entering watercourses

⁴ Havant Thicket Reservoir Project, Environmental Statement Volume 2 – Main Report Chapter 10 Ground Conditions (reference HTR-ATK-ZZ-ZZ-RP-Z-0110, August 2020, rev C03).

Water quality monitoring locations

24. On the basis of the risks and requirements identified in **Section 2**, a pragmatic and proportionate approach to water quality monitoring during the Main Works has been developed, and will include:
- Continuous, i.e., 24 hours/ day, seven days/ week, water quality monitoring probes (sondes) for pH, temperature, and total suspended solids
 - Spot samples to monitor water quality will also be collected from the locations and at the frequencies, and for the determinants, specified in **Table 2-1**
 - Sondes and spot samples will be located/ undertaken at external discharge points, i.e., where water is discharged into an inland freshwater, and selected internal discharge points, e.g., a discharge into the surface water drainage network (**Figure 2-1**)
25. The proposed water quality monitoring locations will provide representative water quality samples from locations upstream and downstream of the Main Works. As the majority of the Main Works occurs within the Riders Lane Stream catchment, rather than the Durrants Stream catchment on the eastern edge of the site, it is not considered to be proportionate to undertake continuous monitoring of water quality in the Durrants Stream.

Water quality parameters to be monitored - Water Framework Directive indicators

26. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 establishes the Environmental Quality Standards (EQS) and the water quality indicators and potential pollutants to be measured. These are identified in the Cycle 2 classifications⁵ and draft Cycle 3 targets⁶ for the Hermitage Stream water body, some of which are stated as contributing towards the current failure to achieve Water Framework Directive (WFD) targets in the water body, notably priority hazardous substances including mercury (**Appendix C**).
27. However, many of these substances are not deemed to be an appropriate measure of whether the Main Works could result in adverse impacts on the identified receptors. These substances have not been found to be present on the site and it is considered unlikely that they would be brought onto site from elsewhere.

⁵ <https://environment.data.gov.uk/catchment-planning/WaterBody/GB107042016370>.

⁶ <https://environment.data.gov.uk/catchment-planning/v/c3-draft-plan/WaterBody/GB107042016370>.

Figure 2-1 Continuous water quality monitoring locations (sondes) (to be updated based on final design and Permit requirements)

Conceptual Site Model

28. The proposed water quality parameters to be monitored have been identified with reference to the Conceptual Site Model (CSM) developed by Atkins (ref: HTR-ATK-RZ-RE-RP-C-0001, 2020). The CSM identifies the following within the vicinity of the borrow pits:
- **Source:** there is minimal potential for in ground sources of contamination. The sources are limited to construction impacts, e.g., excavation activities, fuel leakages, etc.
 - **Pathway:** via shallow groundwater and drainage into surface watercourses
 - **Receptor:** surface watercourses/ ground

Water quality monitoring

29. For the continuous water quality sampling probes (sondes), alarm (action) limits will be established for pH and turbidity/ suspended solids to alert onsite personnel when there is an issue with the water quality; the sondes will send a text alert to pre-defined recipients when the agreed alarm levels are reached allowing proactive action to be taken (**paragraph 33**).
30. For the standalone (spot) samples (**Table 2-1**), where there is an exceedance of the baseline data and/ or the EQS, then a comparison will be made between the downstream and upstream samples to understand whether the breach has been caused by construction activities or is a consequence of an upstream activity, which is beyond the control of the contractor.
31. Additionally, the following visual inspections will be undertaken daily:
- Watercourses/ water quality, for water colour & turbidity, evidence of geomorphological changes, e.g., scour/ bank churn, presence/ absence of surface water films and any other observations using:
 - ◆ EN-A-003 Environmental Daily Watercourse Monitoring Record (**Appendix D**)
 - ◆ HTR-FUW-XX-RE-SC-D-0007 Silt Mitigation Maintenance Schedule (**Appendix E**)
 - Condition of sediment management measures implemented on the Site to ensure that they are operating effectively. Any nonconforming sediment curtains found by inspection will be replaced
 - Photographic evidence of the condition of each watercourse will be collected during each inspection to provide a clear record of site conditions (**paragraph 64**)
32. Where a watercourse, to be sampled, is observed to be dry, then this should be recorded, using photographs, and checked on a regular basis for the presence of water so that the sampling programme can resume. The headwaters of the Riders Lane Stream are ephemeral and are expected to dry up periodically, typically in the period May through to August.

Table 2-1 Water quality parameters and monitoring frequencies for the Main Works (to be updated when the Environmental Permit is granted)

Determinand ⁷	Unit of measurement	Required Limit of Detection ⁸	EQS	Caution limit	STOP limit	Measurement method	Frequency Main Works
Temperature (98 th percentile)	°C	N/A	23	>18 ⁹	>20 ⁰	Multi-parameter sondes	Continuous
pH	pH units	N/A	6.0 – 9.0	<6.5 or >8 ¹⁰	6-9		
Conductivity	mS cm ⁻¹	N/A	N/A	0.3 ¹¹	0.4		
Turbidity	NTU	N/A	N/A	8 ¹²	12		
Total Suspended Solids (TSS)	mg/l	<2	100	35 ¹³	38		
Dissolved oxygen	%	N/A	75% saturation	80%	75%	Laboratory	Weekly
Ammoniacal nitrogen	mg/l	0.20	0.30	N/A	N/A		

⁷ Chapter 15 Water of the Havant Thicket Reservoir Project, Environmental Statement Volume 2 (reference HTR-ATK-ZZ-ZZ-RP-Z-0115 dated September 2020 rev C03) identifies the headwater streams of the Hermitage Stream system as Type 2 rivers. Appropriate values for Good Ecological Status in Type 2 rivers have therefore been adopted where relevant.

⁸ Subject to confirmation with appointed laboratory.

⁹ ES Chapter 15 identifies the 98th percentile temperature in Riders Lane Stream downstream of Havant Thicket (Study Section 3) as ranging between 15.2°C and 17.7°C. The upper value has therefore been adopted as the caution limit.

¹⁰ ES Chapter 15 identifies 5-95th percentile pH as ranging from 6.2 to 8.2 in Riders Lane Stream downstream of Havant Thicket (Study Section 3). Lower values of down to 4.4 were identified in the upstream headwaters. The lowest value has therefore been adopted as the lower STOP limit.

¹¹ ES Chapter 15 identifies average conductivity in Riders Lane Stream downstream of Havant Thicket (Study Section 3) as ranging from 0.341 mS cm⁻¹ to 0.460 mS cm⁻¹.

¹² ES Chapter 15 identifies average turbidity in Riders Lane Stream downstream of Havant Thicket (Study Section 3) as ranging from 11.34NTU to 11.84NTU.

¹³ ES Chapter 15 identifies average TSS in Riders Lane Stream downstream of Havant Thicket (Study Section 3) as ranging from 11.31mg/l to 19.83mg/l, although this is significantly higher in the three headwater streams: HT1 = 50.32 mg/l; HT2 = 109.77 mg/l; HT3 = 364.39 mg/l.

Determinand ⁷	Unit of measurement	Required Limit of Detection ⁸	EQS	Caution limit	STOP limit	Measurement method	Frequency Main Works
Total Petroleum Hydrocarbons – Criteria Working Ground with aliphatic aromatic split (TPH-CWG including BTEX)	µg/l	<0.10 µg/l (per fraction and split)	10 per fraction	N/A	N/A		
If TPH-CWG > 10 µg/l then chromatographs and identification required	N/A		Presence	N/A	N/A		
Fats, oils and greases	mg/l	<1	Presence	N/A	N/A		
Total alkalinity as CaCO ₃	mg/l	<1	N/A	N/A	N/A		
Nitrogen (total and dissolved)	mg/l	<1	-	N/A	N/A		
Phosphate (total and dissolved)	mg/l	<1	-	N/A	N/A		
Cadmium ¹⁴	µg/l	<1	≤0.45 (Class 1) 0.45 (Class 2) 0.60 (Class 3) 0.90 (Class 4) 1.50 (Class 5)	N/A	N/A		
Chromium III short term 95%	µg/l	<1	32	N/A	N/A		
Chromium III long term mean	µg/l	<1	4.7	N/A	N/A		

¹⁴ The EQS for cadmium varies depending upon water hardness, as defined by the concentration of CaCO₃ in mg/l. Class 1: <40 mg/l; Class 2: 40–<50 mg/l; Class 3: 50–<100 mg/l; Class 4: 100–<200 mg/l; Class 5: ≥200 mg/l/.

Determinand ⁷	Unit of measurement	Required Limit of Detection ⁸	EQS	Caution limit	STOP limit	Measurement method	Frequency Main Works
Copper	µg/l	<1	1	N/A	N/A		
Lead	µg/l	<1	14	N/A	N/A		
Mercury	µg/l	<1	0.07	N/A	N/A		
Nickel	µg/l	<1	34	N/A	N/A		
Zinc ¹⁵	µg/l	<1	10.9*	N/A	N/A		

Text in italics denotes parameters that require caution and stop limits to be established once the baseline monitoring has been undertaken

¹⁵ Bioavailable plus Ambient Background Concentration (µg/l) dissolved. Background assumed to be 1.4 µg/l as set out in Part 2, Table 2 of the WFD Directions 2015.

Action Limits

33. Lower (caution) and upper (STOP) action limits will be established for the water quality determinants being monitored by the sondes (**Table 2-1**). When an action limit is reached, the following actions will be taken upon receipt of an Action Limit text message.

Lower (Caution) Limit

34. The process for managing a lower-level alert is as follows:
- Report event to site management
 - Review available water quality data every 15 minutes with baseline data and EQS (**paragraph 30**)
 - Monitor and review onsite operations
 - Visual check and recording of incoming and outgoing (discharges) water sources (see **paragraphs 31 and 32**)

Upper (Stop) Limit

35. The process for managing an upper-level alert is as follows:
- STOP all work located within 30 metres of a watercourse and pumping activities that are discharging
 - Report event to site management
 - Assess current works with the pumping plan to identify which works need to cease, and which could continue, e.g., over pumping activities
 - Undertake visual inspection to verify condition of water quality management measures (see **paragraphs 31 and 32**)
 - Identify whether suspended solids in the water column are elevated and undertake spot measurements (for other parameters) to determine the potential source of the exceedance
 - If determinant concentrations are elevated upstream of the working area, and no issues with the performance of watercourse protection measures are identified:
 - ◆ inform Site Management
 - ◆ inform the Environment Agency that the incident has occurred but has been caused by factors unrelated to the Main Works
 - ◆ restart work
 - ◆ continue to monitor water quality, taking additional samples if required
 - If an issue with the performance of watercourse protection measures is identified:
 - ◆ inform Site Management
 - ◆ report event to the Environment Agency using the Incident Notification Form (HS-A-020A) (**Appendix F**)
 - ◆ continue to monitor water quality, taking additional samples if required
 - ◆ work must not re-commence until the water quality determinants are below the Lower (Caution) Limit
 - ◆ divert water flows through the cleaning ponds, which will provide additional treatment

- ♦ attenuation pond outlets are not directly connected to the ordinary watercourses; the water being discharged has to be pumped to the discharge point, therefore, any water that does not comply with the required standard can be diverted to the water treatment (cleaning) ponds
36. The Future Water MJJV site personnel receiving automated text alerts will include:
- Site Manager
 - Site Environmental Manager
 - Company Environmental Manager - 07766 0747133
 - Site Security – Wilson James - 0345 8735801
37. In the event of the Environment Agency receiving a report of a pollution incident at or near to the Site, including any reports received outside of the normal works hours, i.e., Monday to Friday 7.00 am – 6.00 pm, then they should contact the personnel identified above (**paragraph 36**) to investigate the matter and escalate if remedial action is necessary:

Reporting

38. Upon receipt of the water quality data from the external laboratory, this will be reviewed (**paragraph 30**) and recorded electronically, e.g., Microsoft Excel chart (**paragraph 64**) within the Document Management System (DMS). The data will be presented in a graphical format showing water quality concentrations, as trendlines, over time. Where a determined exceeds the EQS limit, a notification will be submitted to the Environment Agency and emergency management procedures, e.g., stopping work, deployment of containment systems, etc., will be implemented to prevent (further) environmental damage.
39. Water quality data will be shared with Portsmouth Water on a regular basis, e.g., quarterly.

3. Water Quality Management Measures

40. The following section summarises the environmental controls required to manage the water quality risks posed by the construction activities being undertaken at Havant Thicket Reservoir. The construction activity controls include the requirement to develop a Construction Environmental Management Plan (CEMP), which outlines the environment management controls for the Main Works including the protection of water quality. The Contractor is required to regularly review and update the CEMP during the works to reflect the changing nature of the activities undertaken.

Roles and responsibilities

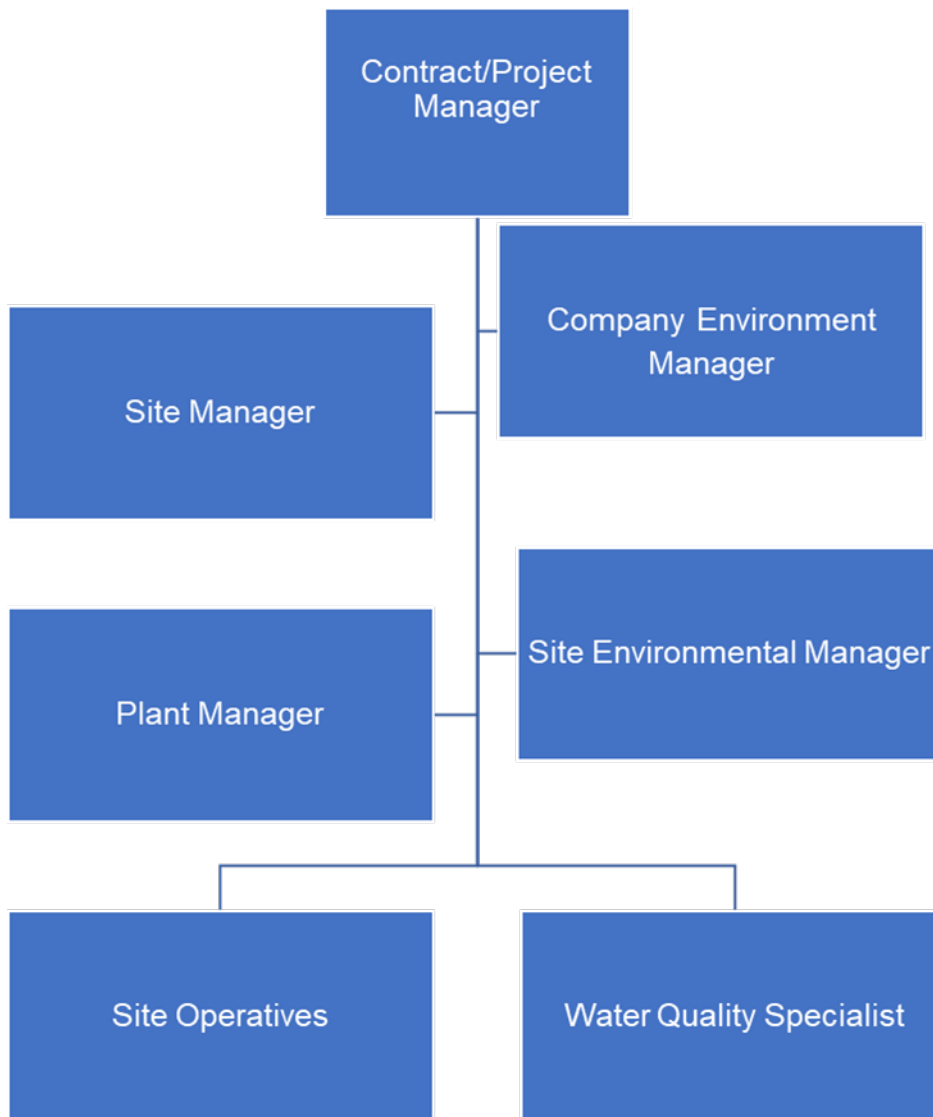
41. The management structure, roles and responsibilities that will apply during implementation of the Main Works are set out in **Table 3-1** and shown in **Figure 3-1**.

Table 3-1 Management structure and responsibilities for water quality during Main Works

Role	Responsibility
Project/ Contract Manager	The Project/ Contract Manager has overall responsibility for oversight of the environmental aspects of the project and will be informed by the Site Environmental Manager in the event of a pollution incidents and/ or non-compliance with the Environmental Permit Conditions.
Site Manager	The Site Manager is responsible for all construction activities and will provide authorisation to undertake remedial activities where required. The Site Manager is also responsible for briefing the Client (Portsmouth Water) on environmental performance and notifying them in the case of any pollution incidents and/ or non-compliance with the Environmental Permit Conditions. The Site Manager will also receive sonde alerts.

Role	Responsibility
Company Environment Manager	The Company Environment Manager will support the Site Manager in determining if and when remedial action is required and for reporting any of pollution incidents and/ or Permit non-compliance to the Environment Agency. The Company Environmental Manager will also receive sonde alerts.
Site Environment Manager	The Site Environment Manager will be responsible for site environmental management and monitoring compliance with the measures outlined in the WQMP and the Environmental Permit Conditions. The Site Environmental Manager will liaise with the Environmental Manager in the event of any potential non-compliances or incidents occurring on site. The Site Environmental Manager will also receive sonde alerts.
Plant Manager	Responsible for checking all plant and equipment upon arrival at the site and will ensure that it is regularly checked and maintained as per the requirements set out in Section 3.6 .
Water Quality Specialist	A suitably experienced Water Quality Specialist will be responsible for ensuring that the water quality data and samples are collected at the specified frequency, reviewed, and reported. They will also be responsible for alerting the Environment Manager and Site Manager of potential breaches and the need to undertake remedial action.
Site Operative(s)	A trained Site Operative(s) will be responsible for the collection of water quality samples and/ or spot measurements in accordance with the WQMP. The Site Operative(s) will receive appropriate training on water sample collection and storage procedures from the Water Quality Specialist. They will also be responsible for alerting the Water Quality Specialist, Environment Manager and Site Manager of potential breaches and the need to undertake remedial action.
Site Security	24-hour security personnel are located on site, monitoring CCTV of key locations, and sonde alerts (these are also communicated to the Site Manager, Site Environmental Manager and Company Environmental manager via text).

Figure 3-1 Havant Thicket role and responsibilities management hierarchy



Responsibility to protect the environment

42. Future Water will comply with the relevant environmental legislation (**paragraph 16**) and detailed within their own Environmental Management System (EMS) and the CEMP. The key environmental management principles outlined in the WQMP to prevent or minimise potential risks to the environment as a result of the construction activities are based on relevant best practice guidance, including Environment Agency guidance, and include:

- Ensure there is no increase to flood risk or impact on drainage
- Minimise sediment being disturbed and moving downstream
- Minimise the impact on biodiversity
- Ensure careful storage of chemicals etc., and disposal of waste, which will be stored in locked storage areas, e.g., cabinets, when not in use
- Prevent pollution of watercourses, e.g., from construction debris or contaminated land

- Prevent pollution from static plant, mobile machinery, refuelling and material storage
 - Prevent or minimise impacts on habitats and wildlife
 - Prevent the spread of invasive non-native species or plant or animal diseases
43. It is Future Water's responsibility to comply with each of the commitments outlined in the CEMP, the Environmental Permit Conditions, and discharge the commitments set out in the REAC (**Appendix B**).

Best practice guidelines

REAC commitment B15

44. Requires Future Water to adopt best practice to avoid pollution of watercourses. This will include, but is not limited to, adherence with relevant CIRIA guidance, and the following GPP/ PPG:
- CIRIA guidance:
 - a. C532 – Control of water pollution from construction sites¹⁶
 - b. C811 – Environmental good practice on site¹⁷
 - GPP/ PPG
 - ◆ GPP 1: Understanding your environmental responsibilities – good environmental practices
 - ◆ GPP 2: Above ground oil storage
 - ◆ GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer
 - ◆ GPP 5: Works and maintenance in or near water
 - ◆ PPG 6: Working at construction and demolition sites
 - ◆ GPP 13: Vehicle washing and cleaning
 - ◆ GPP 21: Pollution incident response planning
 - ◆ GPP 22: Dealing with spills

Management of treatment of surface and groundwater

REAC commitments W1 and W2

45. Control measures will be implemented to manage construction runoff. Water from aggregate hardstanding at the construction compound will discharge into the surface water drainage network where it will be treated via attenuation ponds to remove fine sediment. Water abstracted (dewatered) during the excavation of material, principally the Reading Formation, may also be treated using additional sediment removal techniques, e.g., the use of a polymer-based flocculant, prior to being discharged into the surface water drainage network.
46. To minimise the creation of large volumes of sediment-laden water requiring treatment by flocculant, the use of flocculant, i.e., when it should be used and how to implement it, is detailed in the WTMP (**Appendix A**).
47. Future Water will obtain an Environmental Permit for the discharge of water into Riders Lane Stream. In addition, no discharge will be made into Durrants Stream or Park Lane Stream and their tributaries in accordance with REAC commitment W5 (**Appendix B**).

¹⁶ <https://www.ciria.org/>

¹⁷ [Environmental good practice on site guide \(fifth edition\) \(ciria.org\)](#)

Protection of surface watercourses

REAC commitment B18

48. Silt management measures will be incorporated to protect retained surface watercourses.

The following measures will be implemented:

- The surface water drainage network will be hydroseeded to establish vegetation throughout, to assist in the retention of silt onsite by filtering it from the water to be treated and discharged offsite.
- The establishment of vegetation buffer strips adjacent to all channels and the site boundary to reduce the amount of surface water runoff entering the surface water drainage network.
- The deployment and ongoing maintenance of strategically-placed features to slow flow rates in the channels and reduce the volume of sediment entering the site drainage system. Any installed equipment should be used and installed according to the manufacturer's specifications. These features should include check dams and silt fencing.
- The water treatment apparatus will be installed at locations designated by an issued environmental permit. Apparatus use and installation will be conducted under advice from expert technicians and according to the manufacturer's specifications. Apparatus should include flocculant treatment systems (e.g., Floc Mats™ and pipe reactors) as set out in the WTMP (**Appendix A**).
- Silt fences, other deployed silt mitigation features and apparatus will be visually inspected on a daily basis whilst activities that could potentially generate fine sediment are being undertaken, to ensure that they remain effective.
- The attenuation basins must be shaped and maintained to maximise retention of sediment. This includes removal of silt build up when required or at 6-month intervals.
- The water discharged into Riders Lane Stream will be regulated to prevent pollution entering the stream.
- The water discharged into Riders Lane Stream will contain no more than 40mg/l of suspended solids, as specified in the environmental permit.

Site and equipment maintenance plan

49. Future Water will undertake the following checks and controls for equipment and materials brought to site by Future Water and its contractors will be implemented:

- All plant:
 - ◆ On delivery to the Site, will be subject to an inspection to ensure it is in good condition, serviceable and free from excessive wear and tear, fuel/ oil leaks
 - ◆ Will be subject to daily/ weekly visual checks depending on the type of plant by the operator/ site supervisor. Any required repairs will be logged and undertaken as required
 - ◆ Is (numerically) identifiable and maintained in good condition by regular servicing to ensure the safe and efficient operation
 - ◆ Will be parked safely with guards fitted and loose parts secured, where applicable
 - ◆ Will only be refuelled within designed areas, which must be comprised of hardstanding with sealed drainage
 - ◆ Refuelling pumps are located at least 20m from any watercourse, and the

bowzers are bunded with spill kits located at refuelling areas

- Small plant and tools will be placed within containers that are secured to prevent damage/ loss
- A schedule showing the planned and completed servicing for each vehicle will be maintained
- Generators and other fuel driven plant will not be sited close to open drains and will be at least 20m from any watercourse. They will also have suitable secondary containment systems provided, for example:
 - Single containers – 110% of the container volume
 - Multiple containers – the greater of, 110% of the largest container or 25% of the total volume
- Small plant will be stored in a drip tray or plant 'nappy' to contain any drips or spills
- Fuels and chemicals will be stored securely within a suitable secondary containment system and away, at least 20m, from any drains that would act as a pathway to a sensitive receptor
- All secondary containment systems will be checked daily for leaks/ rainwater. Any collected liquid waste will be disposed of appropriately and in compliance with relevant legislation
- Containers of fuels/ chemicals must be correctly labelled and have appropriate spill kits positioned nearby

Use and storage of substances hazardous to health and the environment

50. During the Main Works, various materials to which Control of Substances Hazardous to Health (COSHH) Regulations 2002 apply will be stored and used on the Site. They include (but are not limited to) the following:

- Fuels, e.g., white diesel, petrol, lubricating oils, hydraulic and engine oils
- Paint including spray paints and thinners
- Detergents and degreasers
- Ad-blue
- Chemicals including bleach
- Concrete and cement
- Silt and fine materials
- Wastewater, e.g., vehicle washing
- Bentonite from the engineering cutoffs

51. Future Water will ensure that all chemicals and oils are stored as per the requirements of **paragraph 44**, and that the Safety Data Sheets are available at all times on site. The Environmental Manager is responsible for ensuring that each chemical and oil etc. used on site has been subject to a COSHH Assessment before arrival on site, and that personnel are made aware of the risks prior to use. Chemicals, and oils, will be stored in locked storage areas, e.g., bunded cabinets, when not in use.

Accidental leakage and polluting debris

REAC commitments B15, GC2 and W1

52. Drainage management and pollution prevention measures are detailed in the REAC (Table 3.1 of the OEMP) and will be adopted to protect human health, controlled waters, and ecology. The Emergency Response Plan (HS-f-093) provides information on how to manage accidental leakages or spillages of hydrocarbons and oils, or accidental release of silt and/ or hazardous substances to watercourses during construction works.

53. Spill kits will be available on site at all times, and operatives will be trained on their use.

Foul water management

REAC commitment W2

54. There will be a permanent connection to the public foul water system once the site welfare compound is constructed. In the interim, all foul water arising from site welfare facilities during the Main Works will be collected and tankered off site for suitable treatment and disposal and in compliance with relevant legislation. It should be noted that the foul water from the caravan area will be tankered away for the duration of the works and will not be connected to the public foul system. There will be no discharges of treated or untreated foul water into the surface drainage network.

4. Contingency and Accident Plan

55. Future Water has implemented an Emergency Response Plan (ERP) for the main works that include the following incidents:

- Excess sediment discharge
- Oil, fuel, or chemical spill
- Fire
- Accident including falls into the water
- Flooding
- Vandalism
- Breakdowns
- Enforced shutdown
- Unexpected circumstances, e.g., contamination, bank instability
- Unplanned changes to operations, such as those driven by adverse weather

56. The ERP will detail how to respond when an environmental incident occurs including who to report to and their emergency contact details, e.g., the Environment Agency. Staff will be briefed on the key aspects of the ERP as part of the site induction and a series of toolbox talks will be delivered to ensure staff are familiar with the ERP and their respective duties.

57. The ERP includes the location of the nearest Accident and Emergency Hospital. Maps showing the route to the hospital, as well as emergency access and egress routes, will be displayed on the Site Notice Board. In addition to the above, the ERP will include details of:

- Potential environmental incidents to be reported, using the Incident Notification Form (HS-A-020A) (**Appendix D**), and the appropriate response required
- The reporting procedure required for near misses, incident and accident and a template report

5. Document Management System

58. The project records, including water quality monitoring data, environmental incidents and complaints will be recorded and reported within Future Water's document control procedures (as outlined in the Quality Plan (doc no. HTR-FUW-ZZ-XX-QA-W-7-S3)).

Complaints procedure

59. The complaints procedure is outlined in the CEMP (doc no. HTR-RHD-P2-RE-PL-Z-0018), and it will be submitted to the local planning authority to discharge planning condition 5.

Staff competence and training records

60. Future Water is required to demonstrate their experience and competence in undertaking similar works and provide evidence that they have suitable systems in place to manage the works. The roles and responsibilities for project implementation and associated experience, including that of persons responsible for health, safety, and environmental matters are defined (**paragraph 41**). Future Water will:

- Confirm the competence of appointed persons to address the environmental, health and safety issues anticipated to arise in the management of the construction phase
- Ensure that all persons employed on site are fully conversant with the relevant safety regulations in operation at the Site and all warnings
- Ensure that its workforce, including sub-contractors and shift workers, are aware of the environmental management requirements of the works
- Ensure that personnel have been trained and are competent for the work they are to undertake and provide training records/ qualifications upon request to confirm training/ competency
- Develop an induction and training programme for all on-site personnel including the provision of regular environmental toolbox talks

61. All construction personnel and visitors, including Future Water and its representatives, will undertake a site induction briefing prior to being allowed to enter the site. Any training, refresher training or qualifications taken by staff or contractors will be recorded retained for 24 months.

62. Future Water employees and contractors undertaking unsupervised work on site are required to hold a Construction Skills Certifications Scheme (CSCS) card. CSCS cards are checked during induction and updated on the personnel training records.

Maintenance of Project Records

63. Future Water will maintain records of all consents, plans, permits, and licences associated with the construction works for a period of at least 24 months (two years). Relevant documents will be passed onto sub-contractors involved with the project as part of the pre-works information pack. Copies will be kept on site during the construction works.

Review of the Water Quality Management Plan

64. Future Water will ensure that any Permit Conditions placed on the proposed activities by the Environment Agency are complied with throughout the works. The WQMP is a live document and will be updated as required throughout the project. Reviews and any required updates will be undertaken when any of the following apply:

- Changes to the site operations or equipment that affect the activities covered by any permits

-
- At the end of each construction season, typically April to September, and/ or redesign of site activities
 - Any application to change (vary) an Environmental Permit
 - Any accident, complaint, or breach of any Environmental Permit
 - The occurrence of an environmental incident which impacts a watercourse or drains
65. Any changes to the WQMP are subject to the review and acceptance of Portsmouth water and must subsequently be provided to the Environment Agency for information.
66. Records of changes will be logged if changes to methodology or control measures are required.

Availability of the Water Quality Management Plan

67. Future Water and its subcontractors involved with the proposed activities will have access to the WQMP, including a copy of all Permits etc., which will be kept on site for the duration of the works.

Appendices

Appendix A Water Treatment Management Plan

Havant Thickett Water Treatment Plan- Sept 2023 FROG/HTR/WTP01

Overview

The site encompasses three borrow pits, which serve as the primary sources for "silt" and untreated water runoff. These are categorized as follows:

1. Reading Clay: This is the largest of the three borrow pits located to the north of the site.
2. London Clay: Situated to the west of the site.
3. Head: Also situated to the west of the site.

Settlement tests were conducted on samples from the three borrow pits, with details outlined in Appendix A. These tests highlighted the need for dividing the water treatment process into three main areas.

For the purpose of monitoring water quality, Jones Bros has enlisted the services of Meteor Communications, who will implement telemetry technology at three designated locations (as outlined in 'SONDES' within Appendix B).

Treatment system

Considering that Reading Clay exhibited the lengthiest settlement times and higher turbidity levels, it is crucial to incorporate flocculant in this area to improve the deposition and separation of solids from the water.

In the case of London Clay and Head, which showed shorter settlement times were observed in lab conditions.

Gel Flocculant is an active silt control product applied in slow-release solid gel blocks. It is designed to separate liquid from solid. Gel Flocculant is stored in dehydrated state and only activates on contact with water. Notably, the Gel Flocculant 494 and 360 blend has proven to be effective in all three treatment areas:

- Reading Clay.

In this area, the primary catchment and attenuation will be situated within the borrow pit itself. Water will be pumped out using a 4-inch pump with a floating head, via a Pipe Reactor. The Pipe Reactor will contain a mixture of Gel Flocculant in a ratio of 3 blocks of 494 Gel Flocculant and 2 blocks of 360 Gel Flocculant.

Downstream of the Pipe Reactor outlet, it is essential to allow a mixing zone of at least 50 meters. Subsequently, 2 Silt Capture Channels will be placed immediately after the mixing zone containing Floc Mats™ and Silt Mats™ (see Appendix C for further details on this treatment setup).

Downstream from these channels, a ditch will convey the treated surface water to basin 1 for further deposition, passing by Sondes 1. If required, there is a possibility of further in-ditch treatment/ capture if required (see Appendix D and Appendix E).

Maximum treatment rates per Pipe Reactor are 1800 litres per minute, though actual capacity may vary depending on local conditions (refer to Appendix C for more details).

- London Clay and, to the West of the site.

A similar approach will be taken. The borrow pit will serve as the primary attenuation point. A Pipe Reactor system, as described above. This setup will be followed by the installation of 2 Silt Capture Channels.

- **Head clay:** this borrow pit will alternately utilise the Pipe Reactor and Silt Capture Channels from the London clay pit as described above. The system switch will be determined by the attenuation capacity demands and adhere to future excavation requirements.

This system is limited to the same flow rates as above, 1800 litres per minute.

It is strongly advised to line all ditches with BioNet or a similar material. This will effectively protect treated water pathways from silt pollution and contribute to the stabilisation of the banks.

Basin 2 outfall (discharge) to accommodate Silt Mats™ for further polishing, prior to final discharge at the southern site boundary.

The Pipe Reactor and Silt Capture Channels offer a versatile and modular solution. This adaptability means that as the earthworks and borrow pit excavations progress, the treatment system can be easily repositioned and resized to accommodate evolving needs and conditions.

Gel flocculant dosing per area

Dosing system		Reading clay	London clay	Head
Pipe Reactor	5no Gel Flocculant blocks	1no. To extract from borrow pit.	1no. To extract from alternating borrow pit.	
Silt Capture Channel	18no Floc Mats per channel	2no	2no	
Gel Flocculant blocks	5no blocks per dosing point	Can be added in ditches for further dosing	X	X
Additional Floc Mats™	3no of Floc Mats™ per dosing point	Can be added in ditches for further dosing	X	X

This table informs the management calculations for acrylamide, aluminium and polyelectrolyte release for the proposed Gel Flocculant dosing system, as detailed in Appendix F.

The Safety Data Sheets for both types of Gel Flocculant can be found in Appendix G.

Emergency measures

If the surface water quality threshold, as per the consent, is not met, the initial course of action will involve suspending pumping operations from the borrow pits. This step will effectively cease the treatment process and prevent the transmission of substandard water quality through the system, thereby safeguarding the ultimate discharge point.

Frog Environmental will be available for immediate review of treatment rates and flocculant dosing.

Appendices

Appendix A - Havant Sept23- Settlement Test and Flocculant Validation Report

Appendix B - HTR-FUW-P2-RE-EN-W-104 - Water Quality Management Plan Aug 23

Appendix C – GN-10v1 _ Pipe Reactor Mobile Water Treatment System Guidance Note Data Sheets

Appendix D – GN-09v1 _ Interceptor and Treatment Ditch Design Guidance

Appendix E – GN-12v1 _ Polishing Channels

Appendix F – AI PP and Acrylamide Calculator Havant Oct23

Appendix G – Gel Flocculant Safety

Appendix A - Havant Sept23- Settlement Test and Flocculant Validation Report

Frog reference	FC****
Customer	Jones Bros
Site	Havant Reservoir
Sample	Collected by Mark Williams on wc 4/09/2023
Date	Test completed on 12/09/2023, report 25/09/2023
Lead Author	Natalia Perez del Postigo, natalia@frogevironmental.co.uk

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<i>Summary of Results</i>	6
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Introduction

Testing has been undertaken on a soil & water sample from the above-mentioned site. The testing process examines the rate of natural separation of solid fraction from water and helps inform the type of silt pollution control measures that may be required during Temporary Works.

frog environmental has a protocol in place that we will first examine the possibilities for treating water without the deployment of flocculants. Only when this avenue has been exhausted through testing and site investigation will frog suggest the use of a flocculant. For more information about the use of flocculants on construction sites, please follow the link: <https://www.frogevironmental.co.uk/pollution-avoidance-and-mitigation/flocculant-use-on-a-construction-site/>

If test result show that a flocculant is required, there is a preference for working with the customer to develop gravity fed treatment systems. Gravity fed systems have several distinct advantages over pumped system:

- Reduced energy and carbon footprint
- Reduced fuel costs
- Reduced pump hire costs
- Reduced risk associated with refueling

A limitation of gravity fed treatment systems can be the effective mixing of flocculant with effluent. In these circumstances, forced mixing using a pumped flow of water can improve reaction times and settlement rates. Gravity fed systems are therefore not appropriate for every site.

About Gel Flocculant

Gel Flocculant is an active silt control product applied in slow-release solid gel blocks. It is designed to separate liquid from solid. Gel Flocculant is stored in dehydrated state and only activates on contact with water. There are several different blends of Gel Flocculant frequently used in the UK and settlement testing establishes the most effective blend for the site in question. In some circumstances a combination of 2 different blends of Gel Flocculant may provide the most effective solid separation.

Gel Flocculant products applied in the UK are synthetic anionic polyacrylamides that also have a coagulating function.

For peer reviewed information regarding the safety of Gel Flocculant and its fate in the environment, a literature review is available from frog environmental upon request.

Management calculations to demonstrate the carry-over concentrations of three key substances; Acrylamide, Polyacrylamide Polyelectrolyte (PP) and Aluminium contained in Gel Flocculant are completed for every project to ensure compliance with relevant Environmental Quality Standards (EQS) for drinking water. These calculations are intentionally conservative and do not account for the factor of the dilution within the receiving waterbody nor any binding to the sediments. It is anticipated that any residual concentrations are present in very small concentrations.

Should there be specific environmental sensitivities, testing for acrylamide and aluminum concentrations in effluent can be undertaken as part of a management system to ensure thresholds are not breached. However, there are no UK laboratory tests available for polyelectrolytes.

Test Process

The aim of testing is to record the natural separation of the solid fraction from water in controlled conditions. The control is tested against different Gel Flocculant blends with reaction times and type of floc produced noted. Where a control shows promise for effective natural settlement this will be recorded in the report and the customer advised of passive silt management interventions.

Once all Gel Flocculant blends have been tested, the most effective blend is photographed and included in the report, with the results of testing from other less effective blends omitted. The control is also photographed for comparison purposes.

Repeated agitation of the same sample gives a good indication for the reaction time required to settle solids from suspension. In each case an NTU reading is taken and shown in the key alongside a photographic record of the test. The level of agitation required for reaction helps to inform a deployment plan.

In some cases, Gel Flocculant will not be effective. Whilst cationic flocculants and liquid products are available, frog environmental do not supply these products for use in 'open' applications, such as surface water drainage from construction sites due to the associated environmental risks.

Where products tested by frog environmental are not effective this will be openly discussed with the client and support provided in objectively reviewing alternative pollution control interventions.

Disclaimer

The use of flocculants on site requires permission from the local regulatory authority. Proceeding with deployment of gel flocculant without regulatory permission is not advised.

Whilst frog environmental provide advice on product specification and deployment, frog environmental is not in control of the construction site or any portion of the construction site at any time. frog environmental do not take responsibility for the quality of water discharging from site at any time and do not accept design liability for the efficacy of any water treatment systems that are developed as part of this report. Please refer to our full terms and conditions prior to procurement, as these will form part of any contract for supply of silt control products and services.

Any product specifications, technical drawings, sketches and site plans provided by frog environmental Ltd in relation to this report are proposals and should be reviewed and approved by the Permanent Works Designer. All proposals are based on the best available data at the time of quotation.

Testing results are indicative and are reliant on the representative nature of samples. Most silt control systems require an element of fine tuning once installed to operate at optimal levels.

Results London Clay

Water Temperature (°C)	16.5	pH	7.49
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A. Control vs 30 min Settlement



B. Control vs 12h Settlement

Turbidity
341 NTU to 149 NTU

Turbidity
341 NTU to 16.36 NTU



A. **Test 1** Control vs WL 494 / 360
(15 seconds agitation plus 30 seconds settlement)



B. **Test 2** Control vs WL 494 / 360
(further 15 second agitation from Test 1 plus 60 seconds settlement)

Turbidity
341 NTU to 63 NTU

Turbidity
63 NTU to 22.38 NTU



C. **Test 3** Control vs WL 494 / 360
(further 15 second agitation from Test 2 plus 60 second settlement)



Turbidity
22.38 NTU to 14.27 NTU

Test 3 Close Up

Results Head

Water Temperature (°C)	16.5	pH	7.79
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C. Control vs 30 min Settlement



D. Control vs 12h Settlement

Turbidity 294 NTU to 90 NTU	Turbidity 294 NTU to 45.41 NTU
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D. **Test 1** Control vs WL 494 / 360
(15 seconds agitation plus 30 seconds settlement)



E. **Test 2** Control vs WL 494 / 360
(further 15 second agitation from Test 1 plus 60 seconds settlement)

Turbidity 294 NTU to 182 NTU	Turbidity 182 NTU to 89 NTU
---------------------------------	--------------------------------



F. **Test 3** Control vs WL 494 / 360
(further 15 second agitation from Test 2 plus 60
second settlement)



Turbidity
89 NTU to 52 NTU

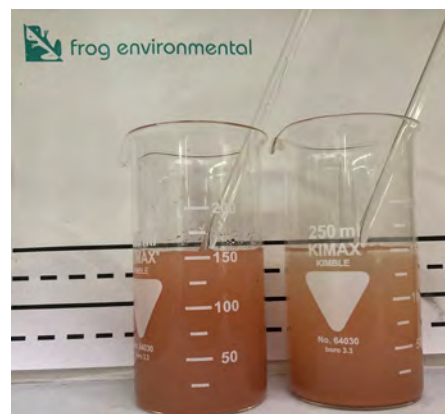
Test 3 Close Up

Results Reading Clay

Water Temperature (°C)	16.7	pH	7.3
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E. Control vs 30 min Settlement



F. Control vs 12h Settlement

Turbidity
885 NTU to 515 NTU

Turbidity
885 NTU to 118 NTU



G. **Test 1** Control vs WL 494 / 360
(15 seconds agitation plus 30 seconds settlement)



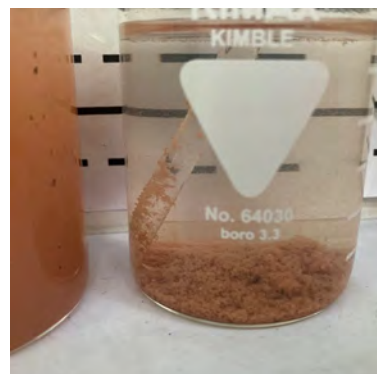
H. **Test 2** Control vs WL 494 / 360
(further 15 second agitation from Test 1 plus 60 seconds settlement)

Turbidity
885 NTU to 114 NTU

Turbidity
114 NTU to 51 NTU



I. **Test 3** Control vs WL 494 / 360
(further 15 second agitation from Test 2 plus 60 second settlement)



Turbidity
51 NTU to 28.22 NTU

Test 3 Close Up

Summary of Results

London Clay

Natural settlement at Havant reduced from 341 NTU to 179 NTU over a period of 10 mins. Settlement for 30 min decreased the NTU further to 149 NTU. A further 2-hour settlement provided a reduction in turbidity to 88 NTU. After 12-hour, the turbidity decreased to 16.36 NTU.

Testing showed the most effective Gel Flocculant to be WL494 in combination with WL360. The first stage of mixing quickly reduced the turbidity from 341 NTU to 63 NTU, with an efficient sediment-flocculant binding. The second stage further reduced the NTU to 22.38, reducing the cloudiness of the sample. The third and final stage reduced the turbidity to 14.27 NTU, forming a uniform medium-sized flocculated sediment.

Head

Natural settlement at Havant reduced from 294 NTU to 117 NTU over a period of 10 mins. Settlement for 30 min decreased the NTU from 117 NTU to 90 NTU. A further 2-hour settlement provided a reduction in turbidity to 90 NTU. After 12-hour, the turbidity decreased to 45.41 NTU.

Testing showed the most effective Gel Flocculant to be WL494 in combination with WL360. The first stage showed slow reaction, reducing the turbidity from 294 NTU to 182 NTU, with the sample remaining cloudy. The second stage sped up the reaction, with a further reduction to 89 NTU, removing some of the cloudiness of the sample. The third and final stage reduced the turbidity to 52 NTU, forming a 'large' flocculated sediment.

Reading Clay

Natural settlement at Havant reduced from 885 NTU to 712 NTU over a period of 10 mins. Settlement for 30 min decreased the NTU 605 NTU, with no visible change. A further 2-hour settlement provided a reduction in turbidity to 515 NTU. After 12-hour, the turbidity decreased to 118 NTU.

Testing showed the most effective Gel Flocculant to be WL494 in combination with WL360. The first stage of mixing quickly reduced the turbidity from 885 NTU to 114 NTU. The second stage further reduced the NTU to 51. The third and final stage reduced the turbidity to 28.22 NTU, forming a uniform and fine flocculated sediment.

Conclusions and next Steps

Physical settlement is present at Havant for the Head and London clay samples. For the Reading clay, natural settlement was present at longer time periods. Flocculant dosing is recommended to speed up the deposition rates, especially during heavy rainfall (high volumes) and achieve clear water. Settlement Testing is a key factor when it comes to assessing the risk of a construction site causing a silt pollution event. However, there are other important factors to consider:

Factor	Why is it important?
Settlement characteristics of particle (defined by Settlement Test)	Defines how the silt particles behaves when in suspension with and without the application of Gel Flocculant
Water Attenuation areas and attenuation design	Attenuation areas slow the flow of water and allow time for silt or floc particles to settle out of suspension. If this can be done without use of flocculant, it should be.
Permitted Total Suspended Solids (TSS) value expressed in mg/l	Notes the quality of water acceptable for discharge.
The flow rate of effluent that requires treatment	Treatment solutions have differing effective treatment rates. Knowing the flow rate helps to come up with the most cost-effective approach.
Proximity and connectivity to watercourse(s)	Where does surface water from your site drain to? It is illegal to cause silt pollution or erosion at the point of discharge.
Knowledge and Experience on site	Skills and knowledge on site can help prevent a silt pollution incident or react quickly to mitigate one
Management Systems	Named roles and responsibilities on site helps a company to respond effectively to an incident.

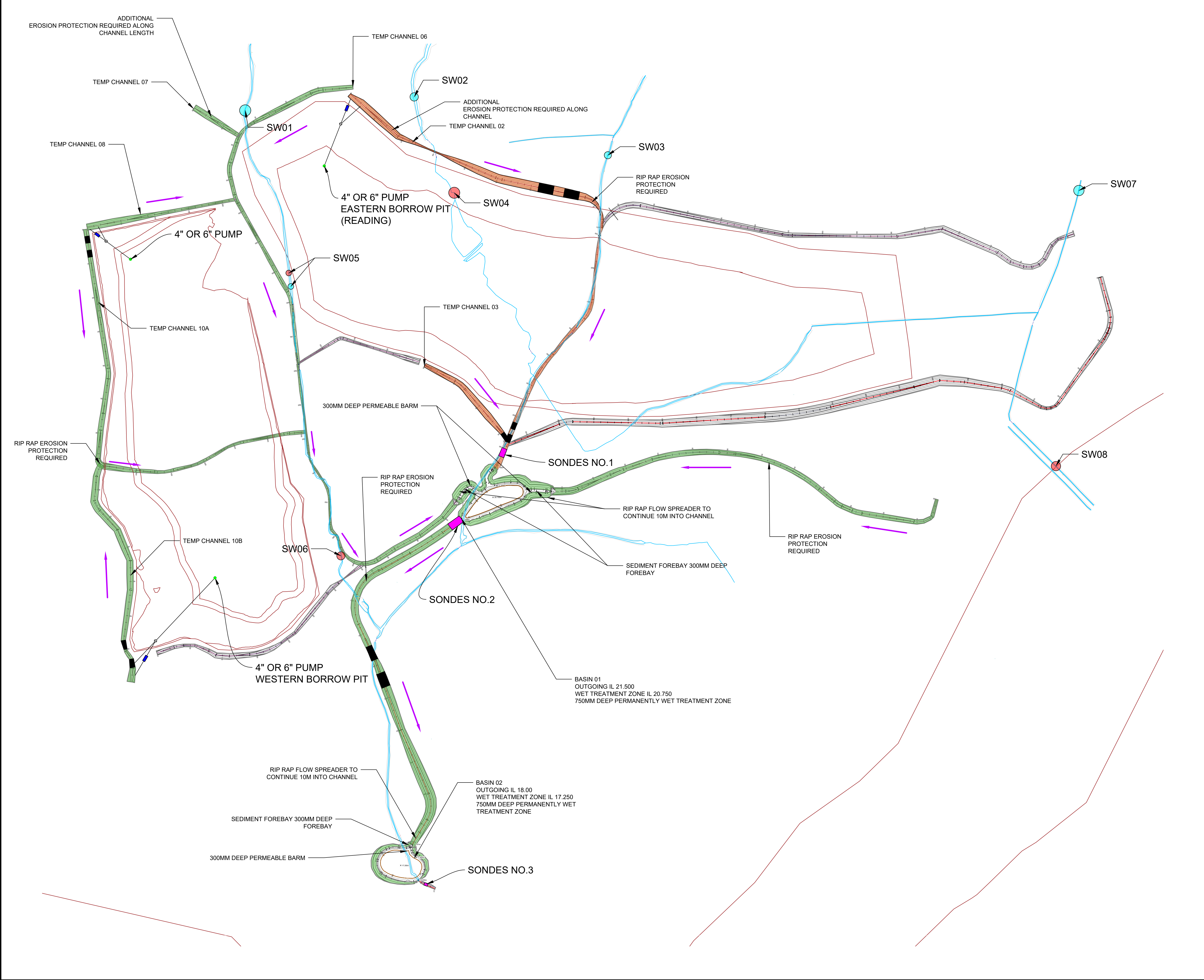
There are 5 key components to a treatment system using Gel Flocculant:

1. **Mixing:** the mixing of effluent with Gel Flocculant, through passive or forced measures.
2. **Capturing:** trapping flocculated particles, either in attenuation features, Silt Capture Channels or a combination of measures.
3. **Maintenance:** removing accreted silt from attenuation features or Silt Capture Channels
4. **Monitoring:** testing effluent quality to ensure compliance
5. **Optimise:** refine the system, scaling treatment up or down depending on the season or the risk associated with a specific construction phase

More information on the deployment of Gel Flocculant is available from frog environmental.

To discuss next steps, contact: Natalia Perez del Postigo (natalia@frogenvironmental.co.uk)

Appendix B - Proposed Surface Water Drainage System



LEGEND

SEDIMENT TREATMENT PROCEDURES

PIPE REACTOR INCLUDING GEL FLUCTUANT

VALVE

SURFACE WATER MONITORING LOCATIONS

UPSTREAM

DOWNSTREAM

Paper Size A1

Rev	Description	Date	Initial

Jones Bros Civil Engineering UK
Ty Glyn
Canol y Dre
Ruthin
Denbighshire LL15 1QA Email: mail@jones-bros.com Tel (01824) 703 661

Client
Portsmouth Water

Site
Havant Thicket Reservoir

Drawing
Proposed Surface Water Drainage Treatment System

Drawn By EG	Date 26/07/23	Checked By MW
Scale 1:2500	Surveyor EG	Revision Date -
Cad Plot Date 26/07/23	Cad File Name Proposed Surface Water Drainage Treatment System	

Appendix C – GN-10v1 _ Pipe Reactor Mobile Water Treatment System Guidance Note Data Sheets



Pipe Reactor Mobile Water Treatment System Guidance Note

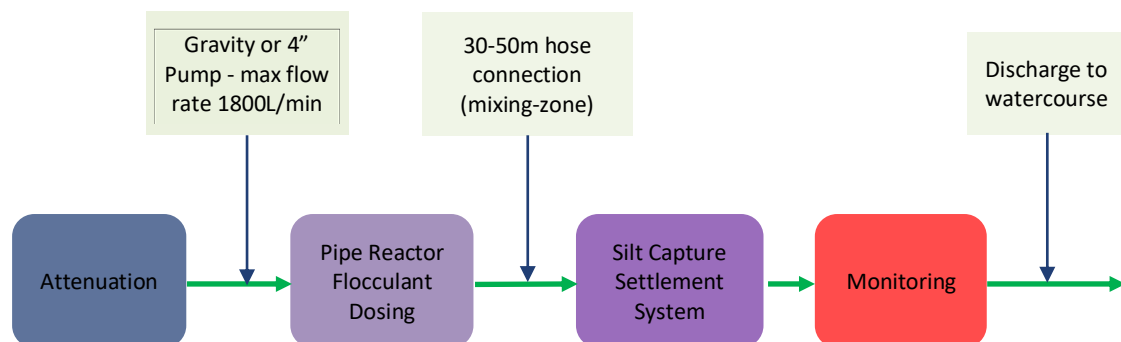
GN-10v1



The Pipe Reactor is designed to optimise flocculant mixing so that when water is passed through the barrel and a mixing-zone, fine silts and clays bind together. Smaller particles then become easier to trap through settlement or in a Silt Capture Channel.

Water may be pumped or moved under gravity through the Pipe Reactor, connected inline to rigid or layflat hose using a 4" Bauer coupling.

The correct deployment of the Pipe Reactor is vital to ensure the suitable mixing and binding of the flocculant, as well as the capture of silt to complete the water treatment process.



Overview of Treatment Process

Principles

- Ensure the water treatment system is easily accessible from site to enable regular maintenance.
- If a pump is used, specify a 4" model with a flow restrictor, the flow restrictor may be a separate element.
- The pump rate will be an important aspect of treatment and may need to be altered to achieve the water quality goals. The maximum flow will be 1800L/min (30L/sec).
- A mixing zone of 30-50m should immediately follow the Pipe Reactor, transferring water to the silt capture. Lay flat hose is a popular option but solid pipes may also be configured.
- The pH of water entering the treatment should be 6-9 to ensure maximum treatment efficacy.
- An NTU of over 3000 will blind the blocks and prevent the system from working effectively.



Pipe Reactor Mobile Water Treatment System Guidance Note

GN-10v1

- Minimise the transfer of heavy silts when transferring water. Do not allow the pump hose or strainer to settle on or draw silts from the ground, instead use a sump, stone pad or float the head. If operating under gravity protect the intake. The pumping from excavations guidance note provides more detail good practice.
- Constantly treat and release water to maximise capacity within attenuation ponds



Capturing Flocculated Silt

Appropriate capture methods include the use of a settlement lagoon, settlement tank and / or a silt capture channel. This aspect should be carefully considered prior to the start-up of the Pipe Reactor.

The capture system needs to be suitably sized to physically settle and filter the 'flocs', the flow may need to be split across two tanks or silt capture channels in parallel to each other to ensure they are not inundated. Silts will need to be removed from the system at regular intervals to retain capacity and treatment efficiency.

Settlement Pond

- A settlement pond can physically settle the 'flocs' effectively separating the silt from the water.
- Ensure no muddy flows are being received by the pond, bypassing the treatment.
- Reference the settlement pond guidance note and adopt good design principles to maximise settlement.
- Prevent silts from becoming entrained in the clean water by releasing water from the surface of the settlement pond to final discharge point via a polishing channel.

Settlement Tank

- Several tank-based systems are available on the market, each having different properties. Utilise the largest volume tank you can obtain, this must have baffles with coalescent media and/or lamella plates. A skip such as a roll on roll off or container may be adapted for this purpose.
- The flow rate will depend on the volume and effectiveness of the internal media, it will be necessary to check the final effluent and alter the flow velocity to attain the water quality required.



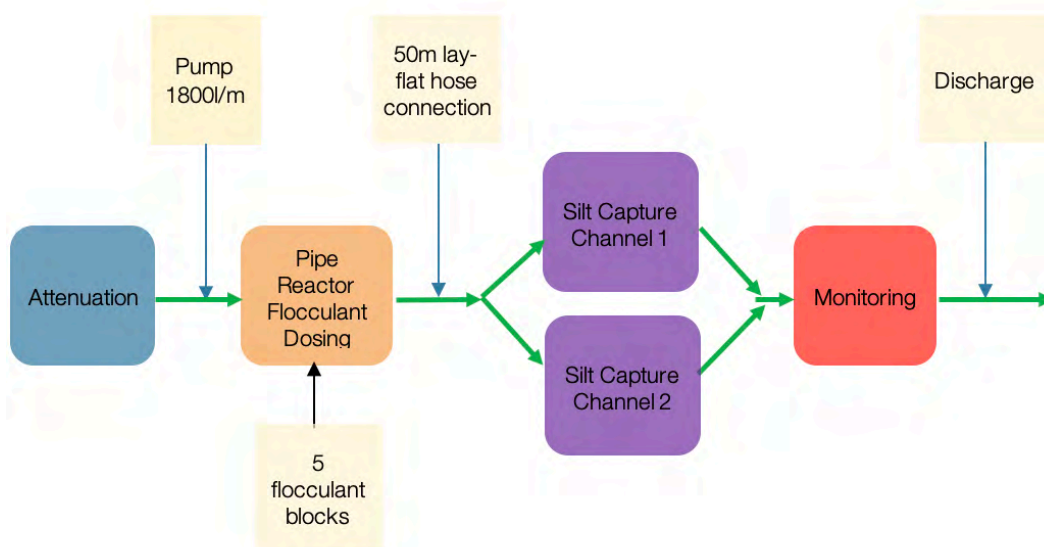
Pipe Reactor Mobile Water Treatment System Guidance Note

GN-10v1

- It is suggested that 900L/min (30L/sec) is likely to be the maximum rate of a standard XXL settlement tank.
- Tanks may be placed parallel to each other, and water split between them to increase treatment efficiency.
- Water must be transferred from the tank to the discharge point without the possibility of new silts becoming entrained in the clean water. A polishing channel may be used before releasing water from site.

Silt Capture Channel

- The Silt Capture Channel is designed to capture silt, separating the solid fraction from water with a maximum flow rate of 900L/min.
- A typical channel is 4m wide and 20m long, lined with an impermeable membrane.
- Silt Capture Channels can be placed parallel to each other, and water split between them to increase treatment rates and efficiency.
- Reference the Silt Capture Channel Installation Method Statement.
- Water must be transferred from the end of the channel to the discharge point without entraining silts in the clean water, this may be an extension of the channel or piped outfall.



Example set up of Pipe Reactor and x 2 Silt Capture Channels

Maintenance and Monitoring

- Monitor the surface water leaving site at the discharge point.
- Ensure that there is a regime of inspection and maintenance of the silt control measures for their continued integrity, remove excess silts from the system, clean settlement media and replace the materials such as Floc Mats, Silt Mats and Water Lynx Blocks.
- Stop all water movement and connection to the discharge point whilst maintenance activities take place to ensure that there is no risk to the wider environment i.e., by a road sweeper suctioning out material and that the excess material can be moved to appropriate storage location.
- Plan where any excess captured silts will be stored and/or used on site to prevent their re-entry into the surface water system.



Pipe Reactor Mobile Water Treatment System Guidance Note

GN-10v1

End notes

- Ensure you have agreement for the use of flocculants from the regulator and the MSDS is available.
- No requirement for storage of liquid coagulants, flocculants or buffering agents is required on site when using Water Lynx gel flocculant blocks.
- There is no possibility of operator error regarding over-dosing or incorrect dosing with the gel flocculant blocks.
- Floc Mats and Silt Mats are comprised entirely of natural biodegradable materials (coir and jute) and so may be reused on site following their function as a silt capture vessel, such as ground stabilisation and seeding
- The flocculants do not change waste classification (EWC code) of the material for waste disposal and reuse on site
- Early engagement regarding site set up affords opportunities to rely on gravity for some parts of the treatment. This reduces reliance on pumps and can significantly reduce carbon footprint and costs, see case study: <https://www.frogeenvironmental.co.uk/case-study/zero-carbon-water-lynx/>

Appendix D – GN-09v1 _ Interceptor and Treatment Ditch Design Guidance



Interceptor and Treatment Ditch Guidance Note GN-09v1



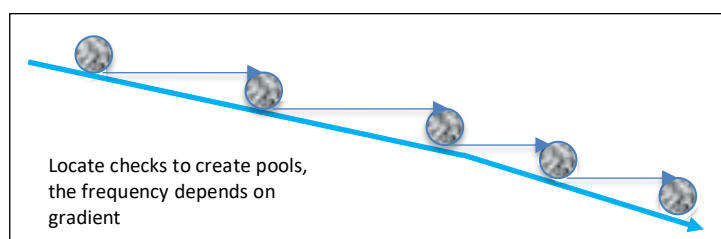
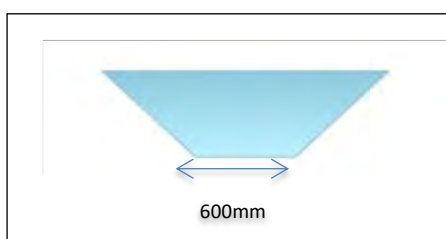
Interceptor ditches are used to interrupt and capture overland flows, diverting water around site to a point of water attenuation or discharge.

Interceptor ditches can form an important part of the silt control on site, poor design can lead to the generation of silt whilst good design can remove silts from the water.

Cut ditches as the project progresses to intercept existing drainage such as field drains or surface water runoff to enable the controlled movement of water on site. Whilst interceptor ditches are normally associated with the site boundary, they may be critical to receive water from haul roads, plateaus and low lying areas or transfer water from pumping operations.

Design Principles

- Position the ditch to remain undisturbed for the duration of the work or as long as the work programme requires.
- Create surface water crossings where haul routes interrupt the drainage route.
- Minimise ground disturbance when cutting ditches, working within the construction site footprint and tracking machinery parallel to the feature.
- Move all excavated material away from the ditch unless it is being used to manage the flow of water such as to create a bund to prevent overtopping or the control the ingress of water.
- The storage of soil on site should follow best practice guidance and not located within 10m of a water course or within an overland flow pathway that could cause erosion of the material.
- Ditches should be profiled with a flat bottom and sloping banks (30° being the steepest).
- Ditches should be sufficiently deep to intercept any land drains and have sufficient capacity to move water.
- Ditches should move water by gravity wherever possible, however, should the gradient of the ditch be greater than 3degrees, create a series of step pools within the ditch using checks. These are necessary to slow the flow, reducing erosion of the bed.



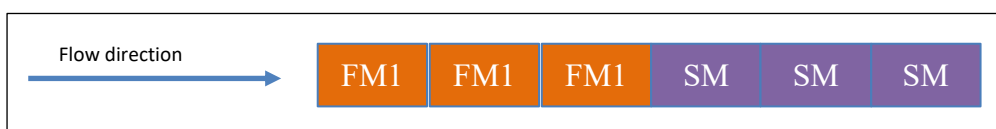


Interceptor and Treatment Ditch Guidance Note GN-09v1

- Checks can be made from a variety of materials such as loose clean aggregate, rock rolls, silt wattles, brash or sand bags. Although it is common to see straw bales used in watercourses this is not advised for any significant period of time as the material starts to degrade releasing nutrients into the water.
- The frequency of the checks will depend on the gradient of the ditch.
- The checks should be contained within the profile of the ditch to prevent overtopping.
- Scour protection must be considered downslope of the check as a cascade will be created.
- Sumps can be dug in advance of the checks to encourage sediment deposition and capture, these features should be easily accessible by machine to enable future maintenance.

If the ditch is being used to remove silts prior to discharge off site

- Consider lining the ditch with a permeable membrane such as terram or erosion control blanket such as SiltNet 700 to reduce scour and the uplift of fine silt into the water column.
- A combination of Floc Mat and Silt Mat should be used to line the ditch, these should be placed in series of Floc Mats and SiltMats as illustrated.

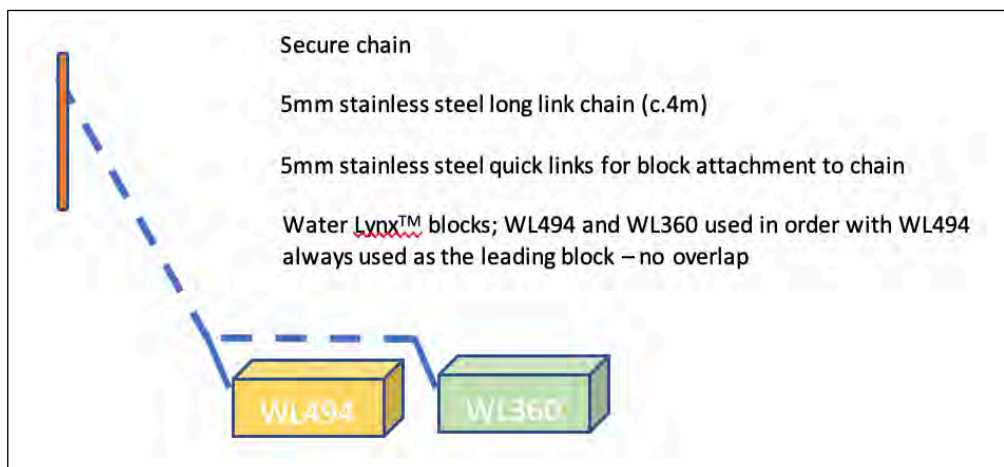


- The number of series of these mats will be iterative depending on the polishing required. This may be lining the ditch of using just a few series at regular intervals.
- SiltMats must always be the final intervention to trap any solids.
- Secure the mats using steel fencing pins or similar.
- It is not recommended to use floc mats and silt mats in advance of a settlement pond as they are likely to become inundated with silts which could be captured in the ponds more cost effectively.

Additional Silt Control Using Flocculant

A flocculant such as the Water Lynx gel flocculant block supports the aggregation of the fine clay and silt particles into larger heavier clumps known as 'flocs' that will more easily fall out of suspension. This will improve the performance of the silt mats and settlement pond.

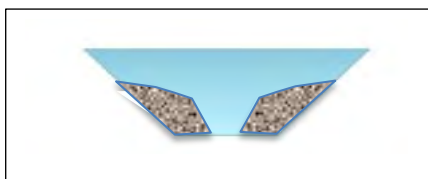
- Introduce Water Lynx gel flocculant blocks (WL494|WL360 in combination) into the ditch upstream of the silt capture (silt mat or settlement pond). Each set of blocks is comprised of 1xWL494 and 1xWL360.





Interceptor and Treatment Ditch Guidance Note GN-09v1

- The ideal placement for the Water Lynx gel blocks in advance of a settlement pond starts 30m upstream of the inflow, then at 20m intervals upstream, the number of sets used will depend on a number of environmental factors and can be altered to achieve the water quality required.
 - Set 1 30m upstream
 - Set 2 50m upstream
 - Set 3 70m upstream
 - Set 4 90m upstream
- The ideal placement for the Water Lynx gel blocks in a ditch that transfers water off site is immediately downstream of the activity producing muddy water. If there are multiple sources of muddy water entering the ditch, then the blocks can be dispersed at c.30-50m intervals but the final placement will not be within 30m of the outfall. The number of sets used will depend on a number of environmental factors and can be altered to achieve the water quality required.
- The water must be turbulent around the blocks to allow the flocculant to be released. A simple way to create turbulence is to narrow the channel at the points of placement, use the checks to generate broken water or cascade of water over the gel blocks or place the gel blocks in a short length of pipe with a 450mm diameter.



- The Water Lynx gel blocks are contained within a net with a loop that can be secured onto a length of chain or rope using quick links.

Maintenance and Monitoring

- Monitor the surface water leaving site at the discharge point
- Checks the silt control measures for their continued integrity, implement a maintenance regime to remove excess silts from the system, replace the materials such as Floc Mats, Silt Mats and Water Lynx Blocks.

End notes

- All consumable items are biodegradable and can be disposed of on site (with correct permissions)
- Presence of Water Lynx in mats or waste silt does not change waste classification (EWC code)
- No requirement for storage of liquid coagulants, flocculants or buffering agents is required on site
- There is no possibility of operator error regarding over-dosing or incorrect dosing
- Early engagement regarding site set up affords opportunities to rely on gravity for some parts of the treatment. This reduces reliance on pumps and can significantly reduce carbon footprint and costs, see case study: <https://www.frogevironmental.co.uk/case-study/zero-carbon-water-lynx/>

Appendix E – GN-12v1 _ Polishing Channels



Polishing Channels following the Settlement Ponds

GN-12v1



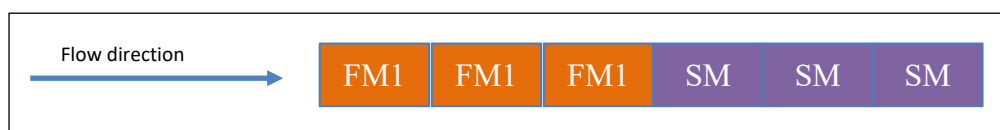
The overflow channel can be used to polish water leaving a settlement pond, acting to remove the solids prior to discharge from site.

Design Principles

- Locate the channel in an area where there is limited plant movement or requirements for crossing.
- Create a formal haul route if a crossing is required, never ford the polishing channel. Reference the Temporary Surface Water Crossings Guidance Note for good practice.
- If the gradient is steep form a series of steps and pools.
- Line with channel to prevent silt entrainment and scour.
- Protect the channel from surface water runoff using bunds or silt fencing where there is a risk.

Polishing Measures

- A combination of Floc Mat and Silt Mat should be used to line the ditch, these should be placed in series of Floc Mats and SiltMats as illustrated.



- The number of mats will be iterative depending on the polishing required, this may be complete coverage or using just a few series at regular intervals.
- Silt Mats must always be the final intervention to trap any solids.
- Overlap Silt Mats and Floc Mats, tucking the downstream mat under the upstream mat.
- Secure the mats using steel fencing pins or similar (sandbags or materials from site).
- Silt Mats must always be the final intervention to trap any solids.



Polishing Channels following the Settlement Ponds

GN-12v1



Monitoring

- Monitor the surface water leaving site at the discharge point
- Checks the silt control measures for their continued integrity, implement a maintenance regime to remove excess silts from the system, replace the materials such as Floc Mats and Silt Mats

Appendix F – AI PP and Acrylamide Calculator Havant Oct23



Gel Flocculant Block Treatment System: Environmental Calculations

Project: Havant Reservoir - Jones Bros

Overview

This sheet provides site specific assurance data for the "carry-over" of key elements to the environment from water treatment using gel flocculant blocks

Calculations are derived from an estimated flow / treatment rate, forecast or known volumes of gel flocculant and compared against a worst case scenario uptake / degradation of gel flocculant blocks

Worst case degradation rates are known from years of site trials, experience and technical review

Carry over rates are compared to the most relevant Environmental Quality Standards (EQS)

The approach is highly conservative, with worst case scenarios being adopted

Carry Over Rates are prior to dilution within the receiving waterbody, nor do they take account of binding / capture within the subsequent methods of silt capture

Site Data

Number of Gel Flocculant Blocks / Mats in system		Flow Rate	
Type	No.	Total Discharge Rate (L / min)	1,800
360	4	Hours run per day	8
494	6	Discharge per day (Litres)	1,728,000
Total	10	Days until replacement of Blocks	30
		Discharge in litres per set of blocks	51,840,000
Number of Floc Mats in system		36	

Aluminium

No. of Gel Flocculant (494)	Forced Mixing Degradation of Blocks in days (Pipe Reactor, typically >80 days)								assive mixing degradation of blocks in days (drainage ditch/ drain/ culver					
	10	20	30	40	50	60	70	80	90	100	110	120	130	140
1	0.005	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
2	0.009	0.005	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3	0.014	0.007	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
4	0.018	0.009	0.006	0.005	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.001
5	0.023	0.011	0.008	0.006	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002
6	0.027	0.014	0.009	0.007	0.005	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002
7	0.032	0.016	0.011	0.008	0.006	0.005	0.005	0.004	0.004	0.003	0.003	0.003	0.002	0.002
8	0.037	0.018	0.012	0.009	0.007	0.006	0.005	0.005	0.004	0.004	0.003	0.003	0.003	0.003
9	0.041	0.021	0.014	0.010	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.003	0.003	0.003

Acrylamide

No. of Gel Flocculant blocks	Forced Mixing Degradation of Blocks in days (Pipe Reactor, typically >80 days)								assive mixing degradation of blocks in days (drainage ditch/ drain/ culver					
	10	20	30	40	50	60	70	80	90	100	110	120	130	140
10	0.094	0.047	0.031	0.023	0.019	0.016	0.013	0.012	0.010	0.009	0.009	0.008	0.007	0.007

Polyelectrolyte

No. of Gel Flocculant blocks	Forced Mixing Degradation of Blocks in days (Pipe Reactor, typically >80 days)								assive mixing degradation of blocks in days (drainage ditch/ drain/ culver					
	10	20	30	40	50	60	70	80	90	100	110	120	130	140
10	0.641	0.321	0.214	0.160	0.128	0.107	0.092	0.080	0.071	0.064	0.058	0.053	0.049	0.046

Project Specific Comparison: Carry Over Levels v Environmental Quality Standards

Discharge carry over aspect	EQS Value		Standard	Project Discharge Value	% below EQS
Aluminium	0.2	mg/l	Drinking Water Standard	0.009	2087.34%
Acrylamide	0.1	ug/l	Drinking Water Standard	0.031	68.83%
Polyelectrolyte	7.5	mg/l	Waste Water Treatment Stand	0.214	3409.03%



SUMMARY / NOTES:

Terms

The use of flocculants on construction sites requires permission from the environmental regulator.

Proceeding with deployment of a flocculant without regulatory permission is not advised.

Every construction site is different and whilst frog environmental provide site-specific proposals, frog environmental is not ‘in control’ of the construction site or any portion thereof at any time

frog environmental do not accept design liability for the efficacy of water treatment systems that are developed in conjunction with the customer.

The quality and quantity of water discharged from site remains the sole responsibility of the customer at all times. Please refer to our full terms and conditions

Appendix G – Gel Flocculant Safety Data Sheets

SAFETY DATA SHEET

Gel Flocculant 360

SECTION 1: IDENTIFICATION OF MIXTURE AND COMPANY

1.1 Product identifier

Gel Flocculant 360

CHEMICAL FAMILY: Polyacrylamide/polyacrylate polymer

CAS NUMBER: none identified

CHEMICAL NAME: none identified

1.2 Relevant Identified Uses

Water treatment

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification

Not classified according to EU regulation 1272/2008 as implemented in The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use) (Amendment etc.) (EU Exit) Regulations 2019.

2.2 Label elements

No labeling required

2.3. Other hazards

No component meets the criteria of a PBT or vPvB substance according to EU regulation 1907/2006 as implemented in The REACH etc. (Amendment etc.) (EU Exit) Regulations 2019 (as amended)

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

There are no components present, within the current knowledge of the supplier that are classified as hazardous to health or the environment and present at concentrations that require reporting in this section.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General

Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid.

Skin

Wash skin with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If irritation occurs get medical attention.

Inhalation

Remove exposed person to fresh air. Seek medical attention if the patient feels unwell.

Eye

Flush eyes with large amounts of water for at least 15 minutes, lifting eyelids to insure complete flushing of surface. Seek medical attention if irritation persists.

Ingestion

Keep at rest. Never give anything by mouth to an unconscious person. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Keep airway clear. Seek

1.3 Supplier

Frog Environmental Ltd

Business Contact

The Byre

0345 057 4040

Blackenhall Park

Emergency Contact

Bar Lane

Staffordshire DE13 8AJ

0345 057 4040 (not 24 hours)

24 Hour Emergency Contact

UK National Poisons Information Service: 0344 892 0111

medical attention.

4.2. Most important symptoms and effects, both acute and delayed.

Signs and Symptoms of Acute Exposure

Inhalation: vapours, mists or dusts of the product may be irritating to the respiratory system. May irritate mouth, nose, and throat.

Ingestion: May cause irritation of the lining of the stomach.

Skin: Mild to moderate irritation can occur.

Eyes: Can cause mild to moderate irritation.

Chronic Health Effects

Prolonged or repeated contact may cause defatting and drying of the skin. Prolonged or repeated contact may cause discomfort and local redness. No known other chronic effects.

4.3 Indication of any immediate medical attention and special treatment needed.

Treat symptomatically.

SECTION 5: FIRE FIGHTING MEASURES

5.1. Extinguishing Media

Suitable: Use extinguishing media suitable for the surrounding fire.

Unsuitable: None.

5.2. Special hazards arising from the mixture

Hazardous Combustion Products: Carbon and Nitrogen Oxides (CO, CO₂, NO_x)

5.3. Advice for Firefighters

Protective Equipment/Clothing: Wear full protective clothing including positive pressure self-contained breathing apparatus.

Fire Fighting Guidance: Fight large fires from maximum distance or use unmanned hose handlers or monitor nozzles. Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until after fire is out.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear appropriate protective equipment (see section 8). Wet product and aqueous solutions of product are very slippery. Trace amounts of product on smooth surfaces can become extremely slippery when wet.

6.2 Environmental precautions

Prevent entry of concentrated solutions into waterways or sewers.

6.3. Methods and materials for containment and clear up

Sweep or scoop dry material and place in appropriate container. Absorb aqueous solutions with a dry inert material, such as clay, and place in an appropriate waste disposal container. After most of the material has been recovered, clean the area with warm, soapy water.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Normal precautions common to good manufacturing practice should be followed in handling and storage. Open and handle container with care. Keep the containers closed when not in use. Avoid physical damage to blocks. Use appropriate personnel protective equipment (See section 8).. Avoid contact with eyes, skin, and clothing. Do not ingest. After handling, wash hands thoroughly with soap and water.

7.2. Conditions for safe storage, including any incompatibilities.

Store in a cool, dry area. Store in accordance with good industrial practices. Keep away from direct sunlight. Protect against physical damage.

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1. Control parameters

None identified.

8.2. Exposure controls

8.2.1. Engineering Controls

No specific measures required.

8.2.2. Individual Personal Protection

Eye Safety glasses are required as a minimum. Use splash goggles or a face shield when eye contact due to splashing is possible.

Skin: Wear nitrile, butyl or Viton® gloves. The specification of glove depends on the work being undertaken; consult manufacturer's recommendations. Breakthrough times >480 mins (thickness ≥0.1 mm). When skin contact is possible for other than the hands, protective clothing including gloves, apron, sleeves, boots, head and face protection should be worn. Protective clothing must be cleaned thoroughly after each use.

Respiratory: No specific measures required.

Thermal: No hazard

Additional Remarks: Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Use care in walking on spilled material. Material spilled on hard surfaces can be a serious slipping/falling hazard.

8.2.3. Environmental exposure controls

No specific measures identified for normal handling and use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Solid.

Colour: Green to white or off-white

Odor: Slight vinegar odour.

Melting Point: > 100 °C

Boiling Point: > 100 °C

Flammability: not flammable

Lower/Upper Flammable Limit: Not applicable

Flash Point: No Data Available

Auto-ignition temperature: No data available

Decomposition temperature: No data available.

pH: 7 (concentration dependent)

Viscosity: Not applicable.

Solubility (Water): Soluble in water but dissolves very slowly.

Partition Coefficient (KOW): No Data Available.

Vapor Pressure: No data available

Relative density: ~1.1

Vapour density: No data available

Particle characteristics: Not applicable, bulk form

Other information : No relevant data identified

SECTION 10: STABILITY AND REACTIVITY

10.1: Reactivity

No hazardous reactions identified. Does not react with air, water or other common materials.

10.2. Chemical Stability

This product is stable.

10.3. Possibility of hazardous reactions

None identified. Hazardous polymerization will not occur.

10.4. Conditions to Avoid

High temperatures.

10.5. Incompatible materials

Oxidising agents. Strong bases may cause the release of ammonia.

10.6. Hazardous Decomposition Products

Carbon and nitrogen oxides (CO, CO₂ NO_x)

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on hazard classes

Acute Toxicity: This product is of a low order of acute toxicity. Oral LD50 (Rat) >5000 mg/kg

Skin Irritation: Mild to moderate irritation can occur. Prolonged or repeated contact may cause defatting and drying of the skin

Eye irritation: Transient mild to moderate irritation can occur.

Respiratory of skin sensitization: No known effects.

Germ cell mutagenicity: No known effects

Carcinogenicity: No known effects

Reproductive toxicity: No known effects

Specific target organ toxicity – single exposure: No known effects

Specific target organ toxicity – repeated exposure: No known effects

Aspiration hazard: not applicable for solids

11.2. Other information

The substance is not expected to have endocrine disrupting properties. No other relevant information identified.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Ecotoxicity

Fish (*Oncorhynchus mykiss*): 96 hr LC_{50} : 140- 150 mg/L.

Invertebrates (*Daphnia magna*): 48 hr EC_{50} : $\geq$ 125 mg/L.

12.2. Persistence and Degradability

Not readily biodegradable but complete mineralization is expected under environmental exposure.

Degradation initialization and rate are dependent on UV levels.

12.3. Bioaccumulation potential

The product is not expected to bioaccumulate.

12.4. Mobility in soil

The product is designed to bind to sediment and soil, so it is not expected to suffer from leaching or mobility.

12.5. Results of the PBT assessment

This product does not meet the criteria of a PBT or vPvB substance.

12.6 Endocrine disrupting properties

The substance is not expected to have endocrine disrupting properties

12.7 Other adverse effects

None identified

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods: Dispose of all waste must be in accordance with all applicable national and local health and environmental regulations. Empty containers should be recycled or disposed of through an approved waste management facility.

SECTION 14: TRANSPORT INFORMATION

14.1: UN number: Not applicable. The products is not classified as dangerous for transport.

14.2: UN proper shipping name: The products is not classified as dangerous for transport.

14.3: Transport hazard classes: Not applicable. The products is not classified as dangerous for transport

14.4: Packing group: Not applicable. The products is not classified as dangerous for transport

14.5: Environmental hazards: None identified.

14.6: Special precautions for users: None identified.

14.7. Maritime transport in bulk: Not applicable. The products is not classified as dangerous for transport

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/ legislation specific for the product

EU REACH: All components of this product have been registered with the European Chemicals Agency or are exempt from registration.

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

15.2. Chemical Safety Assessment

A chemical safety assessment has not been carried out for this product.

SECTION 16: OTHER INFORMATION

DATE: December 2022: First issue:

DISCLAIMER OF RESPONSIBILITY

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SAFETY DATA SHEET

Gel Flocculant 494

SECTION 1: IDENTIFICATION OF MIXTURE AND COMPANY

1.1 Product identifier

Gel Flocculant 494

CHEMICAL FAMILY: Polyacrylamide polymer

CAS NUMBER: none identified

CHEMICAL NAME: none identified

1.2 Relevant Identified Uses

Water treatment

1.3 Supplier

Frog Environmental Ltd

Business Contact

The Byre

0345 057 4040

Blackenhall Park

Emergency Contact

Bar Lane

Staffordshire DE13 8AJ

0345 057 4040 (not 24 hours)

24 Hour Emergency Contact

UK National Poisons Information Service: 0344 892 0111

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification

Not classified according to EU regulation 1272/2008 as implemented in The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use) (Amendment etc.) (EU Exit) Regulations 2019.

2.2 Label elements

No labeling required

2.3. Other hazards

No component meets the criteria of a PBT or vPvB substance according to EU regulation 1907/2006 as implemented in The REACH etc. (Amendment etc.) (EU Exit) Regulations 2019 (as amended)

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

There are no components present, within the current knowledge of the supplier that are classified as hazardous to health or the environment and present at concentrations that require reporting in this section.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General

Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid.

Skin

Wash skin with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If irritation occurs get medical attention.

Inhalation

Remove exposed person to fresh air. Seek medical attention if the patient feels unwell.

Eye

Flush eyes with large amounts of water for at least 15 minutes, lifting eyelids to insure complete flushing of surface. Seek medical attention if irritation persists.

Ingestion

Keep at rest. Never give anything by mouth to an unconscious person. Do not induce vomiting. If

vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Keep airway clear. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed.

Signs and Symptoms of Acute Exposure

Inhalation: vapours, mists or dusts of the product may be irritating to the respiratory system. May irritate mouth, nose, and throat.

Ingestion: May cause irritation of the lining of the stomach.

Skin: Mild to moderate irritation can occur.

Eyes: Can cause mild to moderate irritation.

Chronic Health Effects

Prolonged or repeated contact may cause defatting and drying of the skin. Prolonged or repeated contact may cause discomfort and local redness. No known other chronic effects.

4.3 Indication of any immediate medical attention and special treatment needed.

Treat symptomatically.

SECTION 5: FIRE FIGHTING MEASURES

5.1. Extinguishing Media

Suitable: Use extinguishing media suitable for the surrounding fire..

Unsuitable: None.

5.2. Special hazards arising from the mixture

Hazardous Combustion Products: Carbon and Nitrogen Oxides (CO, CO₂, NO_x)

5.3. Advice for Firefighters

Protective Equipment/Clothing: Wear full protective clothing including positive pressure self-contained breathing apparatus.

Fire Fighting Guidance: Fight large fires from maximum distance or use unmanned hose handlers or monitor nozzles. Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until after fire is out.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear appropriate protective equipment (see section 8). Wet product and aqueous solutions of product are very slippery. Trace amounts of product on smooth surfaces can become extremely slippery when wet.

6.2 Environmental precautions

Prevent entry of concentrated solutions into waterways or sewers.

6.3. Methods and materials for containment and clear up

Sweep or scoop dry material and place in appropriate container. Absorb aqueous solutions with a dry inert material, such as clay, and place in an appropriate waste disposal container. After most of the material has been recovered, clean the area with warm, soapy water.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Normal precautions common to good manufacturing practice should be followed in handling and storage. Open and handle container with care. Keep the containers closed when not in use. Avoid physical damage to blocks. Use appropriate personnel protective equipment (See section 8).. Avoid contact with eyes, skin, and clothing. Do not ingest. After handling, wash hands thoroughly with soap and water.

7.2. Conditions for safe storage, including any incompatibilities.

Store in a cool, dry area. Store in accordance with good industrial practices. Keep away from direct sunlight. Protect against physical damage.

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1. Control parameters

None identified.

8.2. Exposure controls

8.2.1. Engineering Controls

No specific measures required

8.2.2. Individual Personal Protection

Eye Safety: glasses are required as a minimum. Use splash goggles or a face shield when eye contact due to splashing is possible.

Skin: Wear nitrile, butyl or Viton® gloves. The specification of glove depends on the work being undertaken; consult manufacturer's recommendations. Breakthrough times >480 mins (thickness ≥0.1 mm). When skin contact is possible for other than the hands, protective clothing including gloves, apron, sleeves, boots, head and face protection should be worn. Protective clothing must be cleaned thoroughly after each use.

Respiratory: No specific measures required.

Thermal: No hazard

Additional Remarks: Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Use care in walking on spilled material. Material spilled on hard surfaces can be a serious slipping/falling hazard.

8.2.3. Environmental exposure controls

No specific measures identified for normal handling and use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Solid

Colour: Yellow to white or off-white

Odor: Slight vinegar odour

Melting Point: > 100 °C

Boiling Point: > 100 °C

Flammability: not flammable

Lower/Upper Flammable Limit: Not applicable

Flash Point: No data available

Auto-Ignition temperature: No data available

Decomposition temperature: No data available

pH: 5-7.5 (concentration dependent)

Viscosity: Not applicable

Solubility (Water): Soluble in water but dissolves very slowly

Partition Coefficient (KOW): No data available

Vapor Pressure: No data available

Relative density: ~1.1

Vapour density: No data available

Particle characteristics: Not applicable, bulk form

Other information : No relevant data identified

SECTION 10: STABILITY AND REACTIVITY

10.1: Reactivity

No hazardous reactions identified. Does not react with air, water or other common materials

10.2. Chemical Stability

This product is stable

10.3. Possibility of hazardous reactions

None identified. Hazardous polymerization will not occur

10.4. Conditions to Avoid

High temperatures

10.5. Incompatible materials

Oxidising agents. Strong bases may cause the release of ammonia

10.6. Hazardous Decomposition Products

Carbon and nitrogen oxides (CO, CO₂ NO_x)

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on hazard classes

Acute Toxicity: This product is of a low order of acute toxicity. Oral LD50 (Rat) >5000 mg/kg

Skin Irritation: Mild to moderate irritation can occur. Prolonged or repeated contact may cause defatting and drying of the skin

Eye irritation: Transient mild to moderate irritation can occur

Respiratory of skin sensitization: No known effects

Germ cell mutagenicity: No known effects

Carcinogenicity: No known effects

Reproductive toxicity: No known effects

Specific target organ toxicity – single exposure: No known effects

Specific target organ toxicity – repeated exposure: No known effects

Aspiration hazard: not applicable for solids

11.2. Other information

The substance is not expected to have endocrine disrupting properties. No other relevant information identified

SECTION 12: ECOLOGICAL INFORMATION

12.1. Ecotoxicity

Fish (*Oncorhynchus mykiss*): 96 hr LC_{50} : > 2500 mg/L.

Invertebrates (*Daphnia magna*): 48 hr EC_{50} : immobility 705 mg/L.

12.2. Persistence and Degradability

Not readily biodegradable but complete mineralization is expected under environmental exposure.

Degradation initialization and rate are dependent on UV levels.

12.3. Bioaccumulation potential

The product is not expected to bioaccumulate.

12.4. Mobility in soil

The product is designed to bind to sediment and soil, so it is not expected to suffer from leaching or mobility.

12.5. Results of the PBT assessment

This product does not meet the criteria of a PBT or vPvB substance.

12.6 Endocrine disrupting properties

The substance is not expected to have endocrine disrupting properties

12.7 Other adverse effects

None identified

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods: Dispose of all waste must be in accordance with all applicable national and local health and environmental regulations. Empty containers should be recycled or disposed of through an approved waste management facility.

SECTION 14: TRANSPORT INFORMATION

14.1: UN number: Not applicable. The products is not classified as dangerous for transport.

14.2: UN proper shipping name: The products is not classified as dangerous for transport.

14.3: Transport hazard classes: Not applicable. The products is not classified as dangerous for transport

14.4: Packing group: Not applicable. The products is not classified as dangerous for transport

14.5: Environmental hazards: None identified.

14.6: Special precautions for users: None identified.

14.7. Maritime transport in bulk: Not applicable. The products is not classified as dangerous for transport

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the product

EU REACH: All components of this product have been registered with the European Chemicals Agency or are exempt from registration.

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

15.2. Chemical Safety Assessment

A chemical safety assessment has not been carried out for this product.

SECTION 16: OTHER INFORMATION

DATE: December 2022: First issue:

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Appendix B Register of Environmental Actions and Commitments (REAC)(excerpt)

REAC Reference	Commitment	Achievement criteria
B15	Principal Contractor will adopt best practice to avoid pollution of watercourses. This is to include but is not limited to adherence to GPP, latest Environment Agency pollution guidance available from data.gov, and CIRIA guidance on the control of water pollution from construction sites.	• Compliance with the Environmental Permit conditions • Implementation of the measures within the WQMP
B18	Silt control measures to be applied to control siltation risks associated with de-watering activities and construction related discharges.	• Compliance with the Environmental Permit conditions • Implementation of the measures within this plan Quarterly Ecological Clerk of Works (EcoW) progress reports to be provided to the Local Planning Authority during construction.
GC2	Principal Contractor to undertake works in accordance with the Construction (Design and Management) Regulations (CDM Regulations) 2015 and appropriate guidelines and best practice. Principal Contractor to prepare a CEMP to include (but not limited to) the following mitigation measures: • Health and safety Risk Assessment & Method Statement (RAMS) and appropriate Personal Protective Equipment to be implemented for the protection of construction workers in accordance with the COSHH Regulations 2002 (as amended). • Minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion. • Stockpile management (such as water spraying and covering) to reduce contaminated windblown dust and surface water run-off. • Clear segregation between stockpiled material including imported material, excavated material stockpiled for re-use and excavated waste material stockpiled for treatment and/ or off-site disposal. • Implementation of appropriate dust suppression measures to prevent migration of contaminated dust as required. • Implementation of working methods during earthworks to manage groundwater and surface water appropriately and ensure that there is no uncontrolled run-off from the works, any material/ waste stockpiles, and storage containers into adjacent surface watercourses. • Implementation of appropriate and safe storage of fuel, oils and equipment during construction in accordance with the COSHH Regulations. • Implementation of appropriate pollution incident control, e.g., plant drip trays and spill kits. • Implementation of an appropriate Materials Management Plan to document how excavated materials will be managed	• Compliance with the Environmental Permit conditions • Implementation of the measures within this plan Implementation of the Construction Environmental Management Plan (doc no. HTR-RHD-P2-RE-PL-Z-0018) submitted to the local planning authority to discharge planning condition 5.

REAC Reference	Commitment	Achievement criteria
	- Implementation of a contamination watching brief by suitably qualified and experienced personnel to be completed for the Scheme when excavating areas of potential contamination risk. If unidentified contamination is encountered, works to be suspended in the area and appropriate investigations and remediation to be discussed and agreed with stakeholders and completed in accordance with current best practice. - Mitigation measures to be implemented as appropriate in the CEMP, Health and Safety File, Construction Phase Plan, RAMS and Emergency Response Plan.	
W1	A CEMP will be developed which will, as a minimum, include the following pollution prevention measures: - An agreed process for managing the volume and quality of discharge of water for Construction compounds (including CSS) and other areas of hard standing and haulage roads, which will discharge into the site water management systems via shut-off sluice valves which are normally in the closed position and only opened if surface water run-off is of a desired quality. The volume and quality maintenance regime will include an agreed process for monitoring and managed discharge of water from each compound via a sluice valve. - Detail on discharge water quality standards to be attained and suitable technologies, e.g., settlement tanks, silt busters, which will be used to remove pollutants such as fine sediments (silts), debris and other pollutants during the dewatering process. - The discharge methodology will be agreed with the Environment Agency where discharge consents are required. Treatment of arisings is required to maintain appropriate quality using treatment plant prior to discharge to the watercourse. - Flows from the construction site should not increase flood risk or cause watercourse scouring. Up to 1:30 rainfall scenario will be attenuated. - Environmental monitoring to demonstrate compliance (see W3 below). - All oil or chemical storage areas should be bunded and lined in order to contain pollutants in the event of leakage. There should be no storage of materials (or chemicals/ fuels) within 8m of any watercourse. - All machines shall use oil trays when parked on site; all fuel storage tanks shall be adequately bunded to prevent pollution of the river. All reasonable requirements specified by the Environment Agency shall be in place to prevent fuel, lubricants, or any other fluids or materials entering the watercourse. - Procedures to deal with accidental leakages or spillages of hydrocarbons and oils, or accidental release of hazardous substances during construction works. - Debris for any polluting substances that are being brought on site and used as part of the construction process. - Measures to protect the aquatic ecology are set out in B14 and B20 above. - The PC will adopt best practice to avoid pollution of watercourses. This is to include, but is not limited to, adherence to Guidelines for Pollution Prevention (GPP), latest Environment Agency pollution guidance available from data.gov, and CIRIA guidance on the control of water pollution from construction sites.	- Compliance with the Environmental Permit conditions - Implementation of the measures within this plan Implementation of the Construction Environmental Management Plan (doc n0. HTR-RHD-P2-RE-PL-Z-0018) submitted to the local planning authority to discharge planning condition 5.

REAC Reference	Commitment	Achievement criteria
W2	A Drainage Management Plan will be developed, which will include, as a minimum the following detail on 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. - outfalls required for drainage which are 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.	- Compliance with the Environmental Permit conditions - Implementation of the measures within this plan Compliance with the environmental permit conditions. Implementation of the measures within this plan. Implementation of the Construction Environmental Management Plan (doc n0. HTR-RHD-P2-RE-PL-Z-0018) submitted to the local planning authority to discharge planning condition 5. A Drainage Management Plan will be produced and submitted to the local planning authority to discharge planning condition 32.

REAC Reference	Commitment	Achievement criteria
	Foul – all water generated on-site during construction (CCS) and operation (Visitor Centre, Control House) will be transferred to foul drain.	
W3	A water quality monitoring plan will be included in the CEMP, discussed, and agreed with the Environment Agency. This will make provision for the parameters to be monitored, sample locations, frequency, and duration of monitoring. This will include who should undertake sampling, any requirements for visual checks, inclusion of additional monitoring points as part of baseline monitoring, sampling/ laboratory analysis accreditation requirements. The plan should make provision for continuous flow and water quality monitoring in downstream watercourses as well as visual daily monitoring will be undertaken to ensure that the discharge does not result in any scouring of the beds and banks or churn up of silts from the riverbed.	- Compliance with the Environmental Permit conditions - Implementation of the measures within this plan
W5	There will be no water discharges into the Park Lane Stream catchment. All water will be challenged to the head of Riders Lane Stream where flow and quality will be controlled.	- Compliance with the Environmental Permit conditions - Implementation of the measures within this plan

Appendix C Water Framework Directive Environmental Quality Standards for Hermitage Stream

Status of Hermitage Stream (GB107042016370)

The Environment Agency has classified the Hermitage Stream river water body using the EQS presented in **Table 5 1**. The classification status for each EQS displayed in the table has been reproduced from the Environment Agency's own assessment, which is publicly available in the Catchment Data Explorer Tool. Further details regarding the rationale for each status is provided in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

The table also presents the Maximum Allowable Concentration (MAC) for inland surface water bodies for each EQS, as stated in the Regulations, in micrograms/ litre (µg/l). Additionally, the Reasons for Not Achieving Good (RNAG) status and/ or the Reasons for Deterioration (RFD), as presented in the Environment Agency's assessment of the Hermitage Stream water body, are also stated in **Table 5 1**.

Table 5-1 Environment Agency Cycle 3 Classifications for the Hermitage Stream Water Body¹⁸

Classification item	2022 Status unless stated	MAC (µg/l)	RNAG/ RFD
Physico-chemical quality elements			
Acid Neutralising Capacity	High	-	-
Ammonia (Phys-Chem)	High	-	-
Biochemical Oxygen Demand (BOD)	High	-	-
Dissolved oxygen	High	-	-
Phosphate	Moderate	-	Domestic General Public
Temperature	High	-	-
pH	Moderate	-	Domestic General Public Urban and transport
Specific pollutants			
Copper	High	-	-
Triclosan	High	-	-
Zinc	High (2016)	-	-
Chemical			
Priority hazardous substances			
Benzo(a)pyrene	Good (2019)	0.27	-
Benzo(b)fluoranthene	Good (2019)	0.017	-
Benzo(g-h-i)perylene	Good (2019)	8.2 x 10 ⁻³	-
Benzo(k)fluoranthene	Good (2019)	0.017	-
Cadmium and its compounds	Good (2016)	-	-
Class 1 = < 40 mg CaCO ₃ /l		< 0.45	
Class 2 = 40 to < 50 mg CaCO ₃ /l		0.45	

¹⁸ <https://environment.data.gov.uk/catchment-planning/WaterBody/GB107042016370> [Accessed 08/08/2023]

Classification item	2022 Status unless stated	MAC (µg/l)	RNAG/ RFD
Class 3 = 50 to < 100 mg CaCO ₃ /l,		0.6	
Class 4 = 100 to < 200 mg CaCO ₃ /l		0.9	
Class 5 = ≥ 200 mg CaCO ₃ /l		1.5	
Di(2-ethylhexyl)phthalate (priority hazardous)	Good (2016)	Not applicable	-
Dioxins and dioxin-like compounds	Good (2019)	Not applicable	-
Heptachlor and cis-Heptachlor epoxide	Good (2019)	3 x 10 ⁻⁴	-
Hexabromocyclododecane (HBCDD)	Good (2019)	0.5	-
Hexachlorobenzene	Good (2019)	0.05	-
Hexachlorobutadiene	Good (2019)	0.6	-
Mercury and its compounds	Fail (2019)	0.07	No sector responsible
Nonylphenol	Good (2019)	2.0	-
Perfluorooctane sulphonate (PFOS)	Good (2019)	36	-
Polybrominated diphenyl ethers (PBDE)	Fail (2019)	-	No sector responsible
Tributyltin compounds	Good (2016)	0.0015	-
Priority substances			
Cypermethrin (Priority Hazardous)	Good (2019)	6 x 10 ⁻⁴	-
Fluoranthene	Good (2019)	0.12	-
Lead and its compounds	Good (2016)	14	-
Nickel and its compounds	Good (2016)	34	-

Appendix D EN-A-003 HTR Environmental Daily Watercourse Monitoring Record

EN-A-003 – Environment Daily Watercourse Monitoring record (Site Specific)	
Project	C1294 – Havant Thicket Reservoir
Site Address	Future Water MJJV Ltd Havant Thicket Reservoir Havant PO9 4ET
Mobile User	
Date Submitted	

INFORMATION

Information
This form is to be used daily when any site has a watercourse. The forms can be used for any number of Watercourses on site using the sub form below
To add multiple water course checks click on Add record for each check

MONITORING RECORDS

Details of Watercourse Checks									
Watercourse Name	Watercourse Location	Flow in relation to the site	Inspection Date/ Time	Site Activity	Water Clarity	Rainfall in last 24 hours	Oil Film	Photos?	Comments/ Actions Taken
Inspectors Name									
Signature									
Date/ Time of Inspection									

Appendix E HTR-FUW-XX-RE-SC-D-0007 Silt Mitigation Maintenance Schedule

Item	SILT MITIGATION MAINTENANCE SCHEDULE		01/xx/xxxx	02/xx/xxxx	03/xx/xxxx	etc
	Locations	Tasks				
Water sample points.						
1	-	Ensure water flotation aid present, and no trip risks in immediate area. Monitoring equipment (Sondes) are intact and safe area to take water samples.	Yes/ No	Yes/ No	Yes/ No	Yes/ No
2	Basin 02 Outfall	mg/l				
3	Ryders lane outside of site					
4	U/S Hermitage					
5	Ryders lane inlet into Hermitage					
6	Hermitage					
7	D/S Hermitage (Gas Main)					
8	Tidal Limit					
Silt Fencing						
9	-	Carry out silt assessment and ensure silt netting is installed properly with supporting stakes, well grounded and silt netting trenched in the ground at least 15 cm to maintain a solid anchor .	Yes/ No	Yes/ No	Yes/ No	Yes/ No
10	-	Replace any suporting stakes that are broken or torn material should be repaired immediately. If there is a build up of silt, Install a secondary silt fence installation.	Yes/ No	Yes/ No	Yes/ No	Yes/ No
11	Basin 1	mg/l				
12	Basin 2					
13	Reading Borrow pit					
14	London Borrow Pit					
Pumps						
15	-	Pump maintenance checklist, to ensure pumps are running when required.	Yes/ No	Yes/ No	Yes/ No	Yes/ No
16	-	Check exterior for leaks, clean away debris, check for excessive vibration or unusual noises, check heat tracing and temp	Yes/ No	Yes/ No	Yes/ No	Yes/ No
17	H1	tbc				
18	H2	tbc				
19	H3	tbc				
Water Pipes						
20	-	Ensure pipeleine is pumping water, no leaks, flow meters are intact. Pipe Reactor, flocculant gel cartridges are functional	Yes/ No	Yes/ No	Yes/ No	Yes/ No
fresh water overpump						
21	-					
Water courses						
22	-	Check water courses are adequate to mitigate sediment run-off.	Yes/ No	Yes/ No	Yes/ No	Yes/ No
23	-	Replace Rip Rap lining or clear obstacles where required.	Yes/ No	Yes/ No	Yes/ No	Yes/ No

Appendix F HS-A-020A HTR Incident Notification Form

INCIDENT DETAILS

Incident reference below is to be entered by the HSE team only at a later date	
Incident reference (HSE Team Only)	
Exact location of incident (Describe where on site/RTA road name, etc..)	
Date & Time of the Incident	
Type of Incident	
If entered other above please list type of incident here	
Describe what has happened	

WEATHER CONDITIONS

Weather Type	Visibility	Ground Conditions
Photos (max 2)		

Is camera footage available and has been obtained/downloaded?

PRIVACY AND GDPR STATEMENT

When taking personal information from anyone including witnesses and those involved; you may be asked about the FW Privacy & GDPR Policy. Inform them that FW follows GDPR and that more information can be found on the company website or they may contact the HR department on 01824 703661 for more information and a copy of the policy.

PERSONS INVOLVED/ PRESENT

Personnel involved (FW or 3rd Party)

Details of persons involved (FW or 3rd Party)

Name	Employer name/ Member of the Public	Persons Involvement (witness, Injured person etc.):	Mobile Phone Contact:	Describe Injury (if any):	Hospital?:	Was First Aid Administered?:	Carried on working?:	Address:

PROPERTY DAMAGED

Was any plant or equipment involved in the incident?

List of all property damaged

Property Description				

Photos of damage (max 2)				
Photos of damage (max 2)				

ACTIONS

Immediate action taken	
Authorities Notified/Involved	
If answered Other above provide more details here	
Drugs and Alcohol For Cause Requested? (Call Jones Bros on 01824 709222)	

REPORT DETAILS

Report Compiled By (Name)	
Signature of Compiler	
Date & Time of Report Completion	

