Scottish & Southern Electricity Networks

TRANSMISSION

Annex N - Water Construction Management Plan

September 2022

CRAIG MURRAIL SUBSTATION

ANNEX N

WATER CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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Prepared By:

Arcus Consultancy Services

7th Floor
144 West George Street
Glasgow
G2 2HG

T +44 (0)141 221 9997 l **E** info@arcusconsulting.co.uk
w www.arcusconsulting.co.uk

Registered in England & Wales No. 5644976

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1 INTRODUCTION

This outline Water and Construction Environmental Management Plan (WCEMP) forms an Appendix to the Environmental Appraisal Report (EA Report) **Chapter 6: Geology, Hydrology and Hydrogeology** (EA Chapter) for Craig Murrail Substation (the Proposed Development) and a new overhead line (OHL) (the Associated Development).

1.1 Guidance and Legislation

The following legislation and guidance documents have been used to inform the overall WCEMP:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)[1];
- The Water Quality (Scotland) Regulations 2010[2];
- Groundwater Protection Policy for Scotland Version 3 (2009)[3];
- The Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C741)[4]; and
- Guidance for Pollution Prevention (GPP/ PPG) 1: Understanding your environmental responsibilities[5]; and
- Planning Advice Note (PAN) 61 – Planning and Sustainable Urban Drainage Systems[6].

Relevant guidance and best practice document are subsequently provided in the relevant sections of this report.

Relevant guidance documents also include the SSEN General Environmental Management Plans (GEMPs)[7], located in **Annex A**, are listed below. Further information regarding the SSEN GEMPs is detailed in the relevant sections of the WCEMP. The WCEMP is in accordance with the GEMPs listed and that any works by the contractor will be completed in accordance with the GEMPs.

- Oil Storage and Refuelling GEMP (TG-NET-ENV-510);
- Soil Management GEMP (TG-NET-ENV-511);
- Working in or Near Water GEMP (TG-NET-ENV-512);
- Working Sensitive Habitats GEMP (TG-NET-ENV-513);
- Working with Concrete GEMP (TG-NET-ENV-514);
- Contamination Land GEMP (TG-NET-ENV-517);
- Private Water Supplies GEMP (TG-NET-ENV-518); and
- Bad Weather GEMP (TG-NET-ENV-523).

2 DEVELOPMENT REQUIREMENTS

The WCEMP takes into account specific activities during the construction and operational phases of the substation (the Proposed Development), including:

[1] UK Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) [Online] Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made (Accessed 19/11/2021)
[2] The Scottish Government (2010) *The Water Quality (Scotland) Regulations 2010* [Online] Available at: http://www.legislation.gov.uk/ssi/2010/95/contents/made (Accessed: 19/11/2021)
[3] SEPA (2009) *Groundwater protection policy for Scotland Version 3* [Online] Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf (Accessed: 19/11/2021)
[4] CIRIA (2015) *Environmental good practice on site guide* (fourth edition) (C741)
[5] NetRegs (2013) PPG1: Understanding your environmental responsibilities – good environmental practices [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[6] Scottish Government (2001) Planning Advice Note 61: Planning and Sustainable Urban Drainage Systems [Online] Available at: https://www2.gov.scot/Publications/2001/07/pan61 (Accessed: 19/11/2021)
[7] Scottish & Southern Electricity Networks (2020) General Environmental Management Plan (GEMP)

- Hardstanding areas and buildings (substation platform, Gas Insulated Switchgear (GIS), super grid transformer (SGT), two gantries and electrical equipment to connect OHL and proposed substation, turning and parking areas and diesel generator);
- Temporary hardstanding areas (Temporary Works Area);
- Access tracks (upgrade of existing access tracks and new access tracks);
- Security fencing;
- Drainage; and
- Landscaping and felling.

The WCEMP also includes activities associated with the constructional and operational phases of the OHL (the Associated Development), including:

- Hardstanding areas (two new towers and new access tracks);
- Temporary overhead line diversion;
- Felling and vegetation clearance.

2.1 Potential Sources of Pollution

The identified potential sources of pollution as a result of the construction, operational and decommissioning phases of the Project, based on the findings of the EA Report, are as follows:

- Direct disturbance of banks and bed of rivers;
- De-watering of excavations;
- Run-off from exposed ground and material stockpiles;
- Run-off from roads and haul routes and river crossings;
- Plant washings / washing areas;
- Fuel and chemical storage/ refuelling areas;
- Acidification as a result of felling; and
- Leaking / vandalised equipment.

2.2 Scoped Out Measures

The following receptors have been scoped out based on the findings of the **Chapter 6**:

- Public Water Supplies; and
- Groundwater Dependent Terrestrial Ecosystems (GWDTEs).

2.3 Schedule of Mitigation

Mitigation measures are incorporated into the assessment of of effects for geology, hydrology and hydrogeology. A summary of the mitigation measures proposed within **Chapter 6**, are outlined in **Table 2.1**.

Table 2.1: Schedule of Mitigation

Receptor	Potential Effect as identified in Chapter 6	Mitigation specified within Annex N
Construction Phase		
Surface hydrology (watercourses)	Chemical pollution as a result of chemical	Refer to Section 3.3.

Receptor	Potential Effect as identified in Chapter 6	Mitigation specified within Annex N
Construction Phase		
Hydrogeology (groundwater and near-surface water)	handling and storage and onsite vehicle fuelling and maintenance. Pollution from concrete use and washout.	Chemical pollution prevention and appropriate measures for chemical storage outlined in Section 3.3.1. Details of mitigation of spillage incidents and best practice in the event of a spill outlined in Section 3.3.2. Mitigation relating to concrete use on site is provided in Section 3.3.3, and washing of vehicles on site, including concrete washout areas, detailed in Section 3.3.4. Concrete use in watercourse crossing design and construction is outlined in Section 3.4.4. It is recommended that a surface water quality monitoring programme is conducted as good practice, in accordance with Section 3.7.
Surface hydrology (watercourses)	Erosion and Sedimentation as a result of excavation works and track construction and upgrades.	Refer to Section 3.2. Any works to be conducted within or near watercourse refer to Section 3.4 including appropriate measures for construction of watercourse crossings and culverts to prevent erosion of stream beds.
Hydrogeology (groundwater and near-surface water)		
Designated Hydrological Receptors		Refer to Section 3.2. Any works to be conducted within or near watercourse refer to Section 3.4 including appropriate measures for construction of watercourse crossings and culverts to prevent erosion of stream beds.
Surface hydrology (watercourses)	Impediments to surface water flows as a result of installation of watercourse crossings.	Watercourse crossing construction and culverting best practice guidance outlined in Section 3.4 Any works to be conducted within or near watercourse refer to Section 3.4. It is recommended that a surface water quality monitoring programme is conducted as good practice, in accordance with Section 3.7.
Hydrogeology (groundwater and near-surface water)	Diversion of near-surface flow as a result of track construction and the installation of substation foundations / hardstanding.	
Surface hydrology (watercourses)	Increase in volume of run-off and potential flood risk as a result of increased hardstanding.	Site drainage measures and Sustainable Drainage Systems (SuDS) to prevent an increase in flood risk and to maintain natural site drainage as much as possible, are detailed in Section 3.1

Receptor	Potential Effect as identified in Chapter 6	Mitigation specified within Annex N
Construction Phase		
Private Water Supplies (PWS)	Pollution from Proposed Development construction including uncontained spills from vehicles, and chemical handing/ storage. Drying out or changes to quantity as a result of construction of Proposed Development.	Specific measures relating to the protection of water supplies and groundwater abstractions are provided in Section 3.5. Monitoring of PWS water quality would be incorporated into a water quality monitoring programme as outlined in Section 3.7. Measures relating to chemical pollution, sedimentation and site drainage should all be considered as part of PWS protection.

2.4 Regulation and Authorisation

All construction and engineering activities within or hydrologically connected to the water environment require SEPA authorisation under Controlled Activities Regulations (CAR). There are three levels of authorisation and the level required is site-specific and based on the level of risk of the activity to the water environment. The levels of authorisation are:

1. General Binding Rules (GBR): low risk activities. All development activities must comply with these rules. No application to SEPA is required.
2. Registration: medium risk activities. Application to SEPA is required to register an activity.
3. Licence: high risk activity. Simple or complex licences exist depending on the activity. Application to SEPA is required to obtain a licence for the activity.

Further guidance on the requirement for authorisation are outlined in the following documents:

- CAR – A Practical Guide (Controlled Activities Regulations)[8];
- Introduction to Controlled Activities Regulation[9]; and
- SEPA LUPS-GU-15: Planning guidance in relation to SEPA regulated sites and processes[10].

The requirements for authorisation of specific activities are outlined in the relevant sections of this document.

2.4.1 New Licensed Activities

As part of the Proposed Development, activities that will require SEPA licences include groundwater abstraction from a borehole and discharge to groundwater via a septic tank. Detailed design for both will consider and be in line with SEPA guidance. Prior to discharge,

[8] SEPA (2019) *The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide* [Online] Available at: https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf (Accessed: 19/11/2021)
[9] SEPA (n.d.) *Introduction to the Controlled Activates Regulations* [Online] Available at: https://www.sepa.org.uk/media/34800/introduction-to-the-controlled-activities-regulations.pdf (Accessed: 19/11/2021)
[10] SEPA (2013) *Land Use Planning System SEPA Guidance Note 15: Planning Guidance in Relation to SEPA Regulated Sites and Processes (LUPS-GU15)* [Online] Available at: https://www.sepa.org.uk/media/136091/planning-guidance-in-relation-to-sepa-regulated-sites-and-processes.pdf (Accessed: 19/11/2021)

wastewater from the septic tank will be treated in line with SEPA requirements outlined in SEPA WAT-RM-04 Regulatory Method.

Any boreholes required on site for the supply of potable water may also require abstraction licences depending on the abstraction volumes required.

2.5 Environmental Clerk of Works (ECoW)

An Environmental (or Ecological) Clerk of Works (ECoW) will be appointed for the construction period (commencement of Project to final commissioning or end of construction period). The ECoW will hold an advisory role. In relation to the water environment, the scope of the ECoW role will include:

- Monitoring compliance with the mitigation outlined in the EA Report, WCEMP and other relevant documentation relating to the planning condition and site licence, such as the Pollution Prevention Plan (PPP);
- Routine monitoring of water pollution prevention measures, such as silt management measures, and inspection following storm events; and
- Routine visual inspection and observation of watercourses for the presence of silt, discolouration and hydrocarbons.

3 MITIGATION FOR THE WATER ENVIRONMENT

3.1 Site Drainage

Drainage from the site will include elements of SuDS design, where appropriate. SuDS is a method of controlling surface water run-off in a manner that replicates natural drainage patterns and has a number of benefits, including:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off to a certain degree, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

The following best practice guidance should be used:

- CIRIA C648 – Control of water pollution from linear construction projects[11];
- CIRIA C352 – Control of water pollution from construction sites [12];
- CIRIA SuDS Manual (C753)[13];
- CIRIA Guidance on the construction of SuDS (C768)[14]; and
- SEPA WAT-RM-08 Regulatory Method: SuDS[15];
- SEPA WAT-SG-75 Sector-specific Guidance – Construction Sites[16]; and
- Water Assessment and Drainage Guide (WADAG)[17];
- GPP5: Works and maintenance in or near water[18]; and
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer[19].

3.1.1 Authorisation

SuDS are a legal requirement for all developments draining to the water environment (other than a single dwelling or discharges to coastal water). All developments must comply with all conditions of the CAR Regulations GBR including the requirement for SuDS.

Developments require authorisation for surface water run-off discharges under CAR regulations by a SEPA licence (Construction SuDS licence) for construction sites which:

- Exceed 4 hectares (ha) of area;
- Contain a road or track length in excess of 5 km; and / or
- Include any area with a slope gradient of more than 250 m over 1 ha or 500 m length.

[11] CIRIA (2006) *C648: Control of water pollution from linear construction projects: Technical Guidance* [Online] Available at: https://www.ciria.org/ProductExcerpts/C648.aspx (Accessed: 19/11/2021)

[12] CIRIA (2001) *C532: Control of water pollution from construction sites: Guidance for consultants and contractors* [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed: 19/11/2021)

[13] CIRIA (2015) *C753: The SuDS Manual*

[14] CIRIA (2017) *C768: Guidance on the construction of SuDS*

[15] SEPA (2019) *WAT-RM-08: Regulatory Method Sustainable Drainage Systems (SUDS or SUD Systems) v6.4* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 19/11/2021)

[16] SEPA (2018) *WAT-SG-75 Supporting Guidance Sector Specific Guidance: Construction Sites* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 19/11/2021)

[17] SUDSWP (n.d.) *Water Assessment and Drainage Assessment Guide* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 19/11/2021)

[18] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)

[19] NetRegs (2017) *GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed 19/11/2021)

If the Project is below the threshold criteria, a licence is not required and the development can be authorised under GBR10 and no direct consultation with SEPA is required.

SEPA WAT-RM-08 Regulatory Method: SuDS provides further details on the licence requirements.

3.1.2 Pre-Earthworks Drainage

Pre-earthworks drainage relates to the required drainage measures to be installed prior to earthwork activities such as access track construction.

Best practice pre-earthworks drainage measures include:

- Cut-off/ diversion ditches;
- Temporary interception bunds;
- Swales; and
- Retention ponds.

Purpose/ Aim

The aim of pre-earthworks drainage is to:

- Divert 'clean' surface water run-off and stormwater away from exposed soils of earthworks preventing further erosion; and
- Prevent 'clean' water from mixing with potentially silt-laden water generated from construction works.

Installation

Pre-earthwork drainage should be installed immediately prior to earthworks and construction works commencing.

Temporary interception bunds and cut-off drainage ditches ('clean water drains') will be constructed on the 'high-side' boundary of the earthwork operations to prevent surface water run-off entering excavations. Run-off collected in the drainage ditches will be diverted along a channel which follows the natural gradient of the ground, avoiding steep gradients.

The profile of the ditch can vary from a 'v' shape to a 'u' shape but should have a constant uniform depth. The profile of the ditch will depend on the soil type and stability.

The use of 'u'-shaped vegetated ditches is preferential, these are also known as swales. The dimensions and gradient of swales will be kept to a minimum to prevent rapid flow of water. Swales to collect runoff will be placed on the downslope of earthworks and stockpiles and will be designed to treat potentially silty runoff before discharging back into the drainage system. This may include constructing check dams within the channel and employing silt management measures. The use of retention ponds allows for additional storage capacity during heavier rainfall events.

Reinstatement

All pre-earthworks drainage channels should be re-instated unless required for long-term drainage on the site. No exposed soils should remain, and turves should be emplaced to prevent erosion.

Where exposed soil is to be left for a long period before reinstatement or re-seeding, other measure to prevent erosion may be required:

- Geotextiles (biodegradable and non-biodegradable);
- Mulching/ binders/ hydro-seeding;
- Turf cut from other areas on site; and
- Surface roughening.

3.1.3 Earthworks Drainage

Drainage for permanent or semi-permanent earthworks such as access tracks is required to control surface water run-off and discharge to appropriate outlets.

Best practice pre-earthworks drainage measures include:

- Drainage ditches;
- Sumps; and
- Culverts.

Purpose/ Aim

To manage surface water run-off from earthworks e.g. access tracks, and manage and allow for continuity of the natural drainage of surface water and groundwater from higher elevations to lower.

Pre-installation

Prior to access track and earthwork construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Site drainage design will be produced in advance of construction.

Installation

All earthworks will have a gravity drainage system and all water will drain to an adequately sized sump. If dewatering of excavations is necessary, waste water will be treated by designed settlement lagoons and retention ponds, further details are provided in Section 3.2.5.

Trackside drainage ditches are to be constructed parallel to the access tracks and follow the same gradient as the access tracks. To allow for continuity of surface and ground water flow from the high-side of the track to low-side, culverts are required to be built crossing the track at appropriate intervals, as shown in Plate 3.2 to peak river flow plus a climate change allowance of 56% in the Argyll catchment in accordance with SEPA climate change allowances for flood risk guidance[20]. Further details of culvert design are provided in Section 3.4.6.

[20] SEPA (2019) *Land Use Planning System SEPA Guidance: Climate change allowances for flood risk assessment in land use planning* (LUPS-CC1). Available at: https://www.sepa.org.uk/media/426913/lups_cc1.pdf (Accessed: 19/11/2021)

Plate 3:2: Trackside drainage ditch and cross-drainage culvert

Permanent check dams can also be installed to slow the flow of water in ditches with steeper gradients and straightened channels to prevent erosion of channels. Water within channels should be allowed to flow and should not be stagnant, and tracks should be free from standing water through inclusion of camber or cross-fall. Track surface cross-drains can be installed on tracks with long gradients and limited camber, and should be kept free of sediment.

Sustainable drainage systems such as swales with vegetated channels are preferential and will be designed to intercept, filtrate and convey run-off. Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel and, therefore, reduce the potential for erosion.

Settlement lagoons should be installed at drainage ditch outlets, prior to discharge to watercourse. They should be constructed to allow for adequate attenuation of water and settlement of sediments to peak river flow plus a climate change allowance of 56% in the Argyll catchment in accordance with SEPA climate change allowances for flood risk guidance. Silt mats may be used at the outfalls of settlement lagoons and retention ponds to further aid the settlement of sediment from earthworks drainage. Further details on sediment management are provided in Section 3.2.

The use of retention ponds should be used to allow for additional storage capacity during heavier rainfall and storm events.

3.1.4 Management of Drainage from Surplus and Loose Materials

Careful consideration will be given to the location of topsoil and subsoil storage areas for all areas of the Project during construction. Storage areas will be either in a flat dry area away from watercourses, or be protected by the addition of cut off drains above the storage areas to minimise the ingress of water.

The use of peat and soil stockpiles will be minimised by earthworks planning. However, where stockpiles are used, silt fences and silt mats will be employed to minimise sediment levels in run-off.

All stockpiled material will be stored at least 50 m from watercourses in order to reduce the potential from sediment to be transferred into the wider surface water system and will be regularly inspected to ensure that erosion of the material is not taking place.

An example of a stockpile / overburden and the installation of drainage ditch to divert run-off from the stockpile material is shown in Plate 3.1.

Plate 3.1: Stockpile and drainage ditch (under construction)

In accordance with BS 3882 'Specification for Topsoil and Requirements for Use'[21], any long-term stockpiling of topsoil should not exceed 3.0 m in height with a maximum side slope of 1 in 2. In its dry non plastic state, topsoil can be stockpiled in a 'loose tipped' manner and tracked in a compacting method reducing water ingress. Wetter soils can be stored in windrows for drying and later stockpiled for re-use. The re-wetting of peat will be carried out if there is a potential risk of the peat drying out. Mineral and peat soil stockpiles will not be allowed to dry out.

Loose materials such as crushed rock and stone will be prevented from entering watercourses through the employment of sediment pollution prevention measures in areas of loose material storage or generation, as outlined in Section 3.2.

Additionally, excavated stockpiles will be covered with a layer of topsoil and compacted. This will limit the amount of oxygen and water available to cause oxidation of iron pyrite and sulphides, should mining spoil be encountered during excavations. A schematic diagram of a proposed stock pile is provided below:

[21] BSI Group (2015) *Specification for Topsoil and Requirements for Use.* Available at: https://shop.bsigroup.com/ProductDetail/?pid=000000000030297815 (Accessed 19/11/2021)

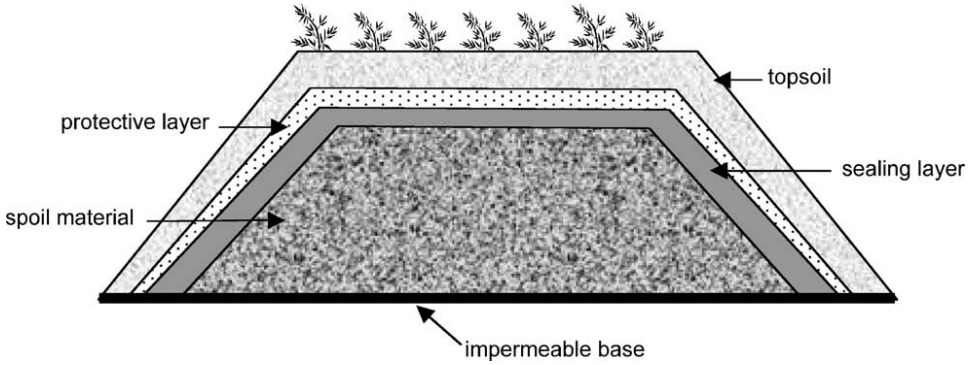

Diagram taken from Johnson & Hallberg 2005[22].

3.1.5 Discharge of Water

Discharge of water from the Project will depend on the water environment on site and the quality of the final discharge. This section considers the discharge of surface water drainage to the water environment and does not consider foul drainage from substation buildings and temporary site compound welfare facilities.

3.1.5.1 Disccharge of water and SuDS system

Treated water can be discharged to watercourse, loch or SuDS systems. The discharge water must be in line with the baseline water quality and flood risk capacity of the receiving water. Full details of the drainage strategy for the Proposed Development is outlined in **Annex L**.

Methods of on-site sediment and chemical pollution prevention and water treatment are outlined in Section 3.2 and Section 3.3.

Authorisation from SEPA is required for discharge of water from the Development to the water environment, as detailed in Section 3.1.5.2.

3.1.5.2 Tanker off site

Water which cannot be treated on site and is not of a quality which can be released to water environment, will need to be tankered off site for appropriate treatment and disposal.

3.1.6 Provision for Storm Events

The Project itself is not at risk from flooding. In extreme storm events, there would be elevated levels of run-off from the hardstanding elements of the Project relative to greenfield flow rates, which has the potential to contribute to down-stream, off-site flood risk. The areas of new hardstanding, in terms of the percentage of the relevant catchments that may be affected, are as follows:

- 0.461 % Dippin Burn; and
- 0.296 % Badden Burn.

In the baseline scenario, the water table is not at the ground surface, and hence some infiltration would be expected. Measures are proposed in this WCEMP that would limit run-off rates in Section 3.2.

Temporary storage volume for storm run-off from the substation foundations and crane hardstanding areas would be provided via settlement lagoons, further details of which are provided in Section 3.2.5.

[22] Johnson and Hallberg (2005) Acid mine drainage remediation options: a review [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969704006199 (Accessed 19/11/2021)

Along the access tracks, drainage channels on the down-slope would shed track run-off to adjacent rough ground approximately every 30 m, to attenuate flow and allow natural filtration to remove sediments. In areas within 50 m of a watercourse marked on an Ordnance Survey 1:50,000 scale map or where cross-slopes exceed 1 in 20, drainage channels will be bunded and outflow will be monitored daily in areas with on-going construction activity.

3.2 Sediment Pollution Prevention

Sediment pollution and release of excess sediments can result in detrimental effects to fish spawning habitats by covering the stream bed. This is of particular importance for the River Thurso SAC whose qualifying interest is Atlantic salmon.

Mitigation measures should minimise mobilisation and release of sediments to the water environment. Water polluted by sediments are not allowed to leave the site untreated and the final discharge from the site must have acceptable levels of sediment (in line with baseline levels).

The contractor will work under a wet weather working policy during construction. Works that could mobilise sediments and impact the water environment would be stopped during heavy precipitation events.

Sediment pollution prevention is to be employed in line with the following best practice guidance:

- SEPA WAT-SG-26 - Good Practice Guide – Sediment Management[23];
- SEPA WAT-SG-78 - Sediment Management Authorisation[24]; and
- CIRIA C648 – Control of water pollution from linear construction projects[25];
- CIRIA C352 – Control of water pollution from construction sites [26]; and
- GPP5 - Works and maintenance in or near water[27].

Best practice methods of sediment management and pollution prevention, and required authorisation are outlined in the following sections. This includes Working In or Near Water GEMP (TG-NET-ENV-512).

3.2.1 Authorisation

Under CAR Regulations authorisation is required for all sediment management works within inland surface water and surface water dependent wetlands.

The levels of authorisation are GBR, Registration or Licence and the required level is based on the environmental risk at the Site. More details are provided in SEPA guidance documents WAT-SG-78 Sediment Management Authorisation and WAT-RM-02 Regulation of Licence level Engineering Activities[28].

[23] SEPA (2010) *WAT-SG-26: Engineering in the water environment: good practice guide – Sediment management* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 19/11/2021)
[24] SEPA (2012) *Supporting Guidance (WAT-SG-78) Sediment Management Authorisation v1* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 19/11/2021)
[25] CIRIA (2006) *C648: Control of water pollution from linear construction projects: Technical Guidance* [Online] Available at: https://www.ciria.org/ProductExcerpts/C648.aspx (Accessed: 19/11/2021)
[26] CIRIA (2001) *C532: Control of water pollution from construction sites: Guidance for consultants and contractors* [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed: 19/11/2021)
[27] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[28] SEPA (2019) *WAT-RM-02 Regulation of Licence Level Engineering Activities* [Online] Available at: https://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/ (Accessed: 19/11/2021)

3.2.2 Silt Traps and Silt Matting

Purpose

Silt traps may be utilised to trap, temporarily store and filter sediment-laden run-off from excavation works at the Project, including tower bases and access tracks. This is to prevent discharge of silt-laden waters to watercourses or ground.

Installation

Silt traps and matting have a limited effective flow capacity and must be installed with the peak river flow plus a climate change allowance of an increase capacity of 56% in the Argyll catchment in consideration.

Silt traps and matting are to be installed at the following locations:

- Within drainage ditches but will be sited to avoid slopes with a gradient greater than 1 in 20;
- At the inlet (sump) or outlet side of culverts; and
- At the outfall of settlement lagoons to filter sediment during times of heavy rainfall as shown in Plate 3.2.

Plate 3.2: Silt matting (combined with silt fencing)

Maintenance

The silt traps and silt matting will be monitored by the ECoW and should be cleared regularly and replaced when necessary.

3.2.3 Silt Fencing

Purpose

Silt fencing is a widely used form of silt trapping and provides a linear barrier for installation upstream of watercourses and lochs. Silt fences are cost-effective and practical methods of attenuating storm water run-off and intercepting sediment and silt.

Installation

Silt fences are a semi-permeable geotextile fabric arranged in the form of a fence (attached to timber posts) as shown in Plate 3.3.

Silt fences are to be used as perimeter controls on the site at the downslope end of earthworks or disturbed soils, and at watercourse crossings as shown in Plate 3:4. They should be used in conjunction with other sediment and water treatment solutions where required.

To comply with best practice, they should be installed as follows:

- Installed perpendicular to the gradient of the slope;
- Construct a trench on the up-gradient side;
- Install stakes on the down-gradient side; and
- Position with a curve to the end of the fence in the up-gradient direction to help capture surface run-off as shown in Plate 3.3.

Silt fences should not be installed in the following:

- Within drainage ditches or channels; and / or
- Running parallel to the direction of slope.

Plate 3.3: Typical Silt Fencing

Plate 3:4: Silt Fencing at Watercourse Crossing

Maintenance

Silt fencing will be monitored by the ECoW and should be cleared regularly of sediment and silt build-up, and after heavy rainfall and storm events. Silt fencing will should be replaced when necessary, as monitored by the ECoW.

3.2.4 Check Dams

Purpose

Check dams will facilitate the settlement of suspended solids by slowing the flow of water within the drainage ditches. An example of a typical check dam is shown in Plate 3.5.

Installation

Check dams will be installed within drainage ditches at regular intervals, where appropriate. Appropriately sized stone pitching will be used within the dam in order to provide a rough surface for water within the drainage ditch to pass over.

Plate 3.5: Check dam example

3.2.5 Settlement Lagoons

Purpose

Retention of contaminated water to allow for the settlement of silt and sediments to an acceptable level (in line with baseline level) prior to discharge to the water environment.

Installation

Settlement lagoons will be implemented where appropriate across the Project and at all tower excavations. They take the form of large trenches dug into the ground and are often bunded.

Settlement lagoons should be installed so as to retain water long enough for silt to settle out. The length of time required will depend on the type of silt with finer silts and clays taking longer to settle.

Further measures may include the use of flocculent to further facilitate the settlement of suspended solids. The appropriateness of flocculent use must be discussed with SEPA prior to its introduction into settlement lagoons. Flocculants can be pollutants if the incorrect dosage is used. Further guidance on the required dimension of settlement lagoon are provided in GPP5.

To comply with best practice, they should be installed as follows:

- Install energy dissipation methods (e.g. rip-rap) at the inlet to minimise flow;
- Install inlet pipe work vertically to dissipate energy of flow in;
- Install a lined inlet chamber and outlet weir with materials such as geotextiles;
- Install a long outlet weir; and
- Install two or three lagoons in a series to increase silt retention and storage as shown in Plate 3.6.

Plate 3.6: Settlement Lagoon Series

Maintenance and Operation

Settlement lagoons should be inspected regularly by the ECoW to ascertain the functionality of the system. To comply with best practice, the following maintenance measures are to be conducted:

- All settlement lagoons will be actively managed to control water levels and ensure that any run-off is contained, especially during times of rainfall;
- A constant pumped inlet rate should be maintained;
- Inlet chamber should be emptied of silt regularly; and
- Discharge quality to be monitored frequently.

Settlement lagoon outflow discharge may be pumped, when required, for maintenance purposes. A 'Siltbuster' is a method of pumping excess silt-laden water and treated prior to discharge, as shown in Plate 3.7.

Plate 3.7: Settlement Lagoon and Siltbuster Pumping Water for Treatment

Any pumping activities will be supervised and authorised by the Principal Contractor's Project Manager.

Methods for discharge of outflow water from a settlement lagoon are detailed in the following section.

3.3 Chemical Pollution Prevention

Pollution from fuels and other chemicals can cause a variety of detrimental effects to freshwater ecology and can lead to loss of aquatic flora and fauna. Cement pollution and concrete wash-out can lead to increases in alkalinity and raise the pH of watercourses, which can be toxic to aquatic flora and fauna.

Chemical pollution prevention is to be employed on site in line with best practice guidance, including the following:

- SEPA Groundwater Protection Policy for Scotland (Section F);
- SEPA WAT-SG-31: Special Requirements for Civil Engineering Contracts for the Prevention of Pollution[29];
- SEPA WAT-SG-32: SEPA Guidance on the Special Requirements for Civil Engineering Contracts[30];
- CIRIA Control of Water Pollution form Construction Sites (C532)[31];
- GPP5: Works and maintenance in or near water[32];

[29] SEPA (2006) *WAT-SG-31: Prevention of pollution from Civil Engineering Contracts: Special Requirements Version 2* [Online] Available at: https://www.sepa.org.uk/media/152233/wat_sg_32.pdf (Accessed: 19/11/2021).

[30] SEPA (2006) *WAT-SG-32: Prevention of pollution from Civil Engineering Contracts: Guidelines for the Special Requirements Version 2* [Online] Available at: https://www.sepa.org.uk/media/152233/wat_sg_32.pdf (Accessed:19/11/2021)

[31] CIRIA (2001) *C532: Control of water pollution from construction sites – Guidance for consultants and contractors*

[32] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)

- GPP8: Safe storage and disposal of used oils[33];
- GPP13: Vehicle washing and cleaning[34];
- PPG18: Managing fire water and major spillages[35];
- GPP21: Pollution incident response planning[36];
- GPP22: Dealing with spills[37]; and
- GPP26: Safe storage – drums and intermediate bulk containers[38].

To reduce the potential for a chemical pollution incident, areas of high-risk activities are to be located away from watercourses and drainage paths. Areas of high risk include:

- Fuel and chemical storage;
- Refuelling areas;
- Material stockpiles;
- Vehicle and equipment washing areas; and
- Site compounds/parking areas.

3.3.1 Storage of Chemicals and Oil

Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The bunded area will be within the construction compound and will be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

Oil storage areas will be covered in order to prevent rainwater collecting within the bunded area.

The chemicals storage area would be kept secure to prevent theft of vandalism. A safe system for accessing the storage area would be implemented by the Principal Contractor.

The following measures should be employed under best practice guidance for storage of chemicals and oils:

- Storage tanks (above or below ground) should have sufficient strength and structural integrity to hold without leak or burst and bunded in accordance with SEPA guidance, and double-skinned tanks should be used for List l substances;
- Storage containers should have a minimum design life of 20 years; and
- All storage containers are closed and locked when not in use.

Chemical storage areas are to be removed from Site as part of decommissioning, any remnant in-situ storage facilities must be appropriately maintained and monitored for degradation and release of oils or chemicals.

[33] NetRegs (2017) *GPP8: Safe storage and disposal of used oils* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/
[34] NetRegs (2017) *GPP13: Vehicle washing and cleaning* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[35] NetRegs (2000) *PPG18: Managing fire water and major spillages* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[36] NetRegs (2017) *GPP21: Pollution Incident Response Planning* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[37] NetRegs (2017) *GPP22: Dealing with spills* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)
[38] NetRegs (2017) *GPP26: Safe Storage – drums and immediate bulk containers* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 19/11/2021)

3.3.2 Spillage of Chemicals and Oil

The temporary works area will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a capacity of 110 % of the stored liquid containers (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater.

Best practice guidance on the prevention of spillages of chemical outlines the following measures:

- Areas where transfer and handling of chemicals is to occur should have impermeable surface;
- Drainage systems onsite should be designed to enable the containment of spillages and appropriate disposal and treatment; and
- Emergency procedures are implemented for a spillage incident and leak detection measures (if appropriate);
- Regular maintenance and inspection of chemical storage facilities to be conducted (may be carried out by onsite ECoW); and
- Provision and training in the use of spill kits, as outlined below.

An appropriately sized spill kit(s) will be provided, maintained and located at strategic points across the site, as shown in Plate 3.8. It is also recommended that all vehicles on-site have spill kits in the event of a spillage from a vehicle. This will contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and will deployed, as necessary, should a spillage occur elsewhere within the construction compound.

Plate 3.8: Spill Kit Provision on Site

Speed limits for vehicles transporting concrete will be set at a maximum of 15 miles per hour (mph) and will be monitored. Maximum vehicle load capacities will not be exceeded. Although tracks will be maintained in good condition, vehicle loads will be reduced when a rougher surface is identified prior to track maintenance.

All maintenance and operation of machinery, and use of chemicals and oils on site, will be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution. All machinery will be equipped with drip pans to contain minor fuel spillage or equipment leakages.

Appointed refuelling personnel will be trained in the correct methods of refuelling on site to ensure that pollution incidents are prevented and a quick response plan is implemented, should a spill occur, to minimise the impact of spills. Toolbox talks will be carried out by the ECoW to personnel on site on the risks of chemical and oil spillages and the procedures in place to handle these.

Regular vehicle and machinery maintenance will be conducted (through daily checklists) to ensure that there is minimal potential for fuel or oil leaks / spillages to occur.

Plate 3.9 and Plate 3.10: Drip Trays and Bunds to Prevent Chemical Spillages show examples of drip trays and bunds.

Plate 3.9 and Plate 3.10: Drip Trays and Bunds to Prevent Chemical Spillages

3.3.3 Substation Chemical Pollution

As part of the Project, transformers (which contain oil) and a diesel generator will be located on-site. Concrete bunds will be in placed designed to accommodate a minimum of 110% of the volume of oil in the transformers to provide an allowance for rainfall. Surface water runoff from the bunds will be routed through an oil interceptor before being discharged via a solid pipe to the swale and not drain into the platform drainage.

The Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs)[39] identified below will be applied during construction. Whilst the risks discussed within this section apply primarily to the operational phase, they have been considered within the construction phase as the equipment will be on site during this period prior to operation.

- PPG2: Above Ground Oil Storage Tanks (January 2018);
- PPG3 Use and Design of Oil Separators in Surface Water Drainage Systems (April 2006);
- GPP8 Safe Storage and Disposal of used oils (July 2017);
- PPG18 Managing fire water and major spillages (PPG18, June 2000);
- GPP21 Pollution Incident Response Planning (July 2021); and
- GPP22 Dealing with Spills (October 2018).

3.3.4 Concrete, Cement and Grout

Concrete, cement and grouts which are batched and transported on site will be subject to the same requirements as outlined in Section 3.3.1.

[39] NetRegs (n.d) Guidance for Pollution Prevention [online] Available at: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ (Accessed 14/01/2022)

To comply with best practice, concrete, cement and grout mixing and washing areas should:

- Be sited in an impermeable hardstanding or geotextile within a designated area;
- Be sited at least 10 m from any watercourse or surface water drain, rock outcrop or sinkhole;
- Install settlement and re-circulation systems for water re-use in the batching process to minimise water use, treatment requirements and risk of pollution;
- Designated and contained washing areas for batching plant and vehicles (further details of vehicle washing provided in Section 3.3.4); and
- Collect contaminated wash waters which cannot be reused and discharge to foul sewer or tanker off-site (further details of discharge of water is provided in Section 3.1.5). Contaminated water should never be released to the water environment.

To prevent pollution, it is important that all concrete pours are planned and that specific procedures are adopted where there may be a risk of surface water or groundwater contamination, in accordance with CIRIA C532. These procedures will include:

- Ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and
- Ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation.

The new operational substation would require a level area of approximately 2.93 ha at a height of 117m AOD. Individual concrete foundation slabs situated will be utilised within the formalised platform to support essential electrical components, and substation control building. Temporary Works Area would consist of one adjacent to the Proposed Development (approximately 2.26 ha) half of which would be permanent operational purposes, and two adjacent to existing access track (0.5 ha and 0.2 ha respectively).

The OHL Tower bases for the Associated Development will also require excavations works and concrete pours.

3.3.5 Vehicle Washing

There will be a wash-out facility within the construction area consisting of a sump overlain with an impermeable geosynthetic membrane. The geosynthetic membrane will filter out the concrete fines leaving clean water to pass through to the sump. The sump water will be pumped to a licenced carrier and taken off-site for approved disposal.

No washing of concrete-associated vehicles will be undertaken outside the wash out facilities, and the area will be signposted, with all site contractors informed of the locations.

The frequency of concrete plant washout may also be reduced through the use of retarders.

Plate 3.12 displays a typical concrete wash-out facility.

Plate 3.11: Concrete Wash-out Facility

In the event that plant and wheel washing is required, dry wheel wash facilities and road sweepers will be provided to prevent (as far as is practicable) mud and debris being carried from within the site onto the public road.

Signage will be put in place to direct all plant vehicles to use wheel wash facilities. The track section between the wash facility and the public road will be surfaced with tarmac or clean hardcore and the area surrounding the facilities will be kept clean and in good condition.

The wheel wash facility, which will work on a closed cycle, shall be operated throughout the construction period. Wheel wash facilities will be located within a designated area of hardstanding at least 50 m from the nearest watercourse or 20 m from the nearest surface drain (in line with buffer zones identified by SEPA). It is expected that these facilities shall be sited adjacent to the site entrance. An example of a dry-ramp wheel wash facility is shown in Plate 3.13.

Should debris be spread onto the site access or public road adjacent to the Project, then road sweepers will be quickly utilised to clean affected areas. Loose debris will also be periodically removed from on-site tracks. All heavy goods vehicles (HGVs) taking construction materials to and from the site will be sheeted to prevent the spillage or deposit of material on the highway.

Plate 3.12: Vehicle wheel wash facility

3.4 Activities in the Water Environment

Temporary activities related to construction phase works within the water environment include construction of temporary and permanent watercourse crossings.

3.4.1 Authorisation

Engineering activities within the water environment, including construction of watercourse crossings, culverting, diversions and dewatering requires authorisation under the Controlled Activities Regulations (CAR).

3.4.2 Watercourse Crossings

The crossing of watercourses is to be avoided in the design where possible. Existing culverts and watercourse crossings, may be upgraded (see **Figure 6.6**) and anticipated to be replaced with suitable pre-cast culvert designs.

Where required to be installed, watercourse crossings should be designed in order to minimise effects of developments on the natural integrity and continuity of watercourses. The following best practice guidance should be used:

- Forest and Water Guidelines[40];
- SEPA WAT-SG-25 River Crossing – Good Practice Guide[41];
- SEPA WAT-PS-06-02: Culverting watercourses[42]; and

[40] Forestry Commission (2011) *Forest and Water Guidelines, 5th Edition,* Forestry Commission [Online] Available at: https://www.confor.org.uk/media/246145/forest-and-water-guidelines.pdf (Accessed: 19/11/2021).

[41] SEPA (2010) *WAT-SG-25 Engineering in the water environment: good practice guide. River Crossings.* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/f (Accessed: 19/11/2021).

[42] SEPA (2015) *WAT-PS-06-02: Culverting of Water courses - Position Statement and Supporting Guidance* [online] Available at: https://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/ (Accessed: 19/11/2021).

- CIRIA C689: Culvert design and operation guide[43].

Pre-installation

Identification of ecological requirements and limiting factors (e.g. breeding birds and fish spawning) should be conducted prior to installation of a watercourse crossing. The ECoW should be consulted before watercourse crossing construction can commence.

The hydraulic capacity of the crossing is to be assessed and constructed peak river flow plus a climate change allowance of 56% in the Argyll catchment. Further information on the hydraulic capacity of a watercourse crossing or culvert is outlined in SEPA River Crossing – Good Practice Guide.

Watercourse crossings should not be installed in 'active' areas of a watercourse e.g. meandering bends and depositional areas.

Consideration should be given to the type of watercourse crossing acknowledging that hard engineering structures, such as concrete culverts, can make it more difficult to restore a site or decommission temporary structures e.g. access tracks. Bottomless arched culverts will be used for smaller scale crossings, as shown in Figure 3.10. Further details on the type of culvert to use is provided in Section 3.4.6.

Installation

The use of in-situ fresh concrete in the construction of watercourse crossings will be avoided where possible by the use of pre-cast elements. Watercourse crossings will be installed perpendicular to the direction of flow.

No existing or new watercourse crossings are expected to be required for the Proposed Development. It is anticipated the following type of watercourse crossings are to be installed on site, if determined to be required:

- Ready-made bottomless arched concrete or plastic culverts.

However, in accordance with best practice guidance, each watercourse crossing shall be designed on a case-by-case basis to be appropriate for the width of watercourse being crossed, and the prevailing ecological and hydrological situation (i.e. the sensitivity of the watercourse). A number of factors, both environmental and engineering will influence the selection of structure type and the design of the crossing.

All watercourse crossings should be installed in line with SEPA WAT-SG-25 River Crossing good practice guide. General good practice in watercourse crossing design and construction will ensure that site conditions are taken into account and the objectives of the CAR are achieved. These include:

- The use of appropriate structures to carry access tracks across watercourses taking into account the scale of the watercourse, ecological value, sensitivity to construction activities, topography and construction methodology;
- There is a preference to avoid construction in watercourses altogether through the use of arch culverts appropriately designed not to impede the flow of water and allow safe passage for wildlife, such as fish, water voles, otters etc;
- When installing culverts, care will be taken to ensure that the construction does not pose a permanent obstruction to migrating species of fish, or riparian mammals (i.e. the crossings will make provision for fish and wildlife migration);
- Culverts should be sized so that they do not interfere with the bed of the stream post construction, (i.e. the crossings will leave the watercourse in as natural condition as possible or permit re-establishment of substrate post construction);

[43] CIRIA (2010) *C689: Culvert design and operation guide* [Online] Available at: https://www.ciria.org/Resources/Free_publications/C689.aspx?WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91 (Accessed: 19/11/2021)

- Single culverts will be used in preference to a series of smaller culverts that may be more likely to become blocked with flotsam and create erosion (i.e. the crossings will not constrict the channel);
- To minimise impacts on the breeding of any fish found, any in-stream works in these areas will be conducted during months which have less impact on their breeding and development, where possible;
- Ease and speed of construction are important to minimise disruption to the watercourse and surrounding habitat;
- Culverts and headwalls should be designed to last the operational life of the Development;
- Designs should be low maintenance and where possible self-cleansing; and
- Structures should be visually in keeping with the surroundings.

Maintenance

Erosion to the bed and banks at a watercourse crossing as a result of scouring during high rainfall and storm events. Erosion can expose span structure foundations and/ or cause a drop forming at the outlet of the watercourse crossing.

If this occurs, the inclusion of erosion protection measures may be required, such as baffles. The crossing should be reinstated and reinforced to allow for scour during higher flows. The crossing should be reinstated to allow for fish passage and continuity of the watercourse bed. If this is not possible, inclusion of a fish pass may be required.

If maintenance works are required within the watercourse bed then isolation of the watercourse is required, as detailed in Section 3.4.2, and authorisation from SEPA may be required.

Culverts are prone to blockage by debris and may require routine clearing.

3.4.3 Culverts

Culverts are used to create artificial channels and allow for the continuity of water drainage and balance upstream and downstream of infrastructure associated with the Proposed Development e.g. access tracks.

Closed culverts for river crossings would only be justified for single track roads over small watercourses (<2 m wide). Closed culverts are sufficient for cross-drainage under an onsite access track, as outlined in Section 3.1.3.

Bottomless arch culverts and box culverts should be used for all culverts over watercourses of 2 m or greater in width.

Culverts will be installed and designed in line with best practice guidance, including CIRIA C689, and incorporate the following criteria:

- Culverts will be well bedded to avoid settlement and protected by an adequate cover of road material;
- The substrate and side/ head walls will be reinforced in order to prevent erosion;
- The culverts will be designed such that it does not cause a barrier to movement of fish or other aquatic fauna;
- Culvert floors will have the same gradient (not exceeding a slope of 3 %) and level, and carry similar bed material and flow, as the original stream;
- There shall be no hydraulic drop at the culvert inlet or outlet;
- The width of the culvert will be greater than the active channel width of the watercourse;
- The culvert must not exacerbate or create flooding;
- Culverts will be used to conduct water under the Substation tracks;

- Any fences or screens fitted on the inlet or outlet of the culvert will be designed to allow at least 230 mm of space between the bars of the screen of fence, up to the high-water level;
- A natural stone headwall will be provided upstream and downstream of culverts to protect the road embankment. Further protection will be provided to the banks using soft engineering techniques as much as possible; and
- Where there is risk of bed erosion upstream or downstream of culverts, natural stone rip-rap will be provided.

3.4.4 Dewatering

Dewatering may be required for excavations or construction of substation foundations. Dewatering is regulated under CAR GBR15 if less than 10m^3 per day.

Dewatering should be employed in line with the following best practice guidance:

- SEPA WAT-SG-29: Temporary Construction Methods;
- SEPA Good Practice Guide WAT-SG-28: Intakes and Outfalls[44]; and
- SEPA Regulatory Method WAT-RM-11: Licensing Groundwater Abstractions including Dewatering[45].

If the dewatering volume is greater than 10m^3/ day, a CAR licence is required and SEPA WAT-RM-11 is to be referred to. Discharge of water as a result of dewatering must not cause further erosion and energy dissipation measures should be put in place as outlined in SEPA WAT-SG-28 guidance.

Dewatering must consider the impact on other groundwater abstractions. Further information on the protection of groundwater abstractions are provided in Section 3.5.

Alkali (limestone) may be added to the base of dewatering pits to buffer acidic water, should intrusive site investigations indicate the presence of acid mine water in near surface groundwater. Settlement lagoons may also be constructed with a composting layer also allow for the treatment of any ochre water before being discharged into the hydrological system. A schematic diagram is displayed below:

Plate 3.18: Settlement Lagoon

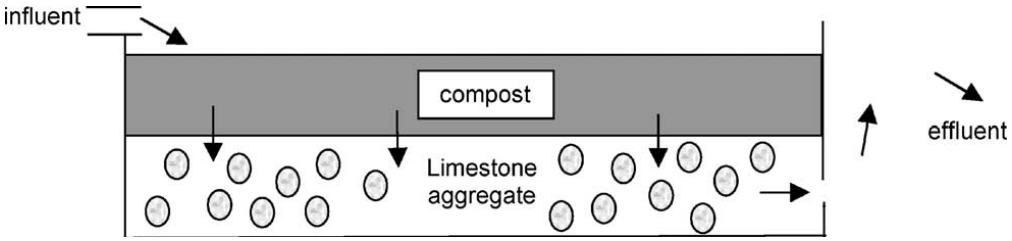

Diagram taken from Johnson & Hallberg 2005[46].

3.5 Measures to Protect Private Water Supplies

Construction of foundations and linear infrastructure such as roads, tracks and trenches can disrupt surface water and groundwater flow. If carried out in close proximity, this can affect water quality and quantity at water supplies. The PWSRA (**Annex M**) identified that PWS Auchoish may be impacted and mitigation in the form of surface water monitoring would be required.

[44] SEPA (2019) *WAT-SG-28: Engineering in the Water Environment Good Practice Guide: Intakes and outfalls Second Edition* [Online] Available at: https://www.sepa.org.uk/media/150984/wat_sg_28.pdf (Accessed: 19/11/2021)

[45] SEPA (2017) *WAT-RM-11: Regulatory Method: Licensing Groundwater Abstractions including Dewatering* [Online] Available at: https://www.sepa.org.uk/media/151997/wat-rm-11.pdf (Accessed: 19/11/2021)

[46] Johnson & Hallberg 2005. "*Acid mine drainage remediation options: a review*" [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969704006199 [Accessed 19/11/2021].

Measures to protect Public and Private Water Supplies (PWS) are based on mitigation and good practice detailed in Section 3.2 and Section 3.3.

Additional mitigation specific to PWS are detailed in the Private Water Supplies GEMP (TG-NET-ENV-518). This includes the development of a site specific PWS Protection Plan for any PWS indicated to be at risk through consultation and assessment. This protection plan should include water quality testing and preparation of a contingency plan in the event of a problem with the existing supply. Any supplies determined to be at risk from the Project will be monitored in accordance with the water monitoring programme outlined in Section 3.7.

3.6 Measures to Protect Water Environment from Tree Felling and Removal

The following measures will be implemented during tree felling as part of the Development to ensure that harvesting methods are in accordance with good practice:

- Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains;
- Brash will not be stockpiled within 50 m of a watercourse;
- The area within 50 m of watercourses shall be regarded as a "sensitive area";
- During felling operations within "sensitive areas", silt traps or temporary dams will be used in local ditches to prevent sediment entering watercourses, and silt fences will be constructed locally between working areas and watercourses;
- Any work in "sensitive areas" to be approved by the Infrastructure Contractor's Project Manager and the ECoW;
- If felling is to occur in the riparian zone (the interface between land and a flowing surface water body) of a watercourse, trees will be felled away from the watercourse;
- Brash mats will be used for vehicle trafficking to protect bare soils;
- Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20;
- Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation; and
- Silt matting if used to be checked on a daily basis and replaced as required.

3.7 Water Quality Monitoring Programme

A surface water monitoring programme will be established prior to the construction phase of the Development. An indicative monitoring programme is set out below.

Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Development infrastructure and upstream of other non-natural influences, where possible.

Regular visual inspections of surface watercourses are proposed, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated and remedial action taken to prevent further effects, if necessary.

To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis. Details will be agreed with SEPA in advance of construction.

The following sampling frequency is proposed in order to establish baseline hydro-chemical conditions of surface water constituents:

- Once every month for twelve months prior to the construction phase.

Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures.

The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions:

- Once a month in-situ monitoring and sampling for the duration of the construction phase; and
- Once a month in-situ monitoring and sampling for six months during the post construction phase.

Private water supplies identified to be impacted by the Development will also require monitoring at the source. The following sampling frequency is proposed during construction:

- Once every month for twelve months prior to the construction phase to establish baseline conditions;
- Once a month in-situ monitoring and sampling for the duration of the construction phase; and
- Once a month in-situ monitoring and sampling for six months during the post construction phase.