SITE ENVIRONMENTAL MANAGEMENT PLAN

VIKING WIND FARM

TECHNICAL SCHEDULE 4

DRAINAGE MANAGEMENT PLAN

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1 INTRODUCTION

1.1 Objectives

1.1.1 The information contained herein forms Technical Schedule (TS4) of the Viking Wind Farm Wind Farm Site Environmental Management Plan (SEMP). This document provides a Drainage Management Plan which will be used by the Balance of Plant Contractor (the *Contractor*) to develop a detailed Drainage Management Plan (DMP) and associated construction method statements for both temporary drainage controls required during construction works and permanent drainage works to be incorporated into the detailed design of the wind farm.

1.1.2 The objective of this DMP is to provide a benchmark for best practice such that all possible preventative measures will be taken to avoid pollution of the water environment via the drainage network during construction works and during the operational phase of the wind farm.

1.1.3 The *Contractor* will submit the detailed DMP to the Employer and the Ecological Clerk of Works (ECoW) for approval prior to any construction works commencing in any area of the site.

1.2 Sensitive Areas

1.2.1 The following areas are considered to be particularly sensitive with respect to potential impacts from pollution which may result from inadequate drainage control:

- All water course crossings. The *Contractor* is required to identify all crossings shown on the OS 1:50,000 map, the OS 1:10,000 map and crossings identified during a walk over. The *Contractor* will be required to produce a water course crossing plan for these in line with the requirements of TS5.
- Access tracks / infrastructure and borrow pits within 50m of a water course. The *Contractor* is required to identify all areas in proximity to water courses in his detailed DMP.
- Any historical peatland drains and ditches within the main wind farm area.

1.3 Contractor's detailed DMP: Scope and Minimum Requirements

1.3.1 The detailed DMP will be built on information contained within this DMP, current industry best practice, and any information obtained during the detailed design works. The *Contractor*'s detailed DMP will be an evolving document(s) as the wind farm is constructed, and will be fully integrated with the Site Environmental Management Plan (SEMP).

1.3.2 The DMP may comprise a number of separate drainage plans (e.g. drawings and method statements) for each of the main phases of works, works areas, or works in proximity to sensitive receptors. The purpose of these plans is to identify potential risk areas and design bespoke drainage and mitigation measures specific to that particular locality or works activity.

1.3.3 The DMP will incorporate the following minimum requirements:

i. Procedures and methods for planning, design and management of appropriate sediment and silt control measures. The control measures will be designed appropriately to comply with the Contract for a minimum of a 1 in 200 year rainfall event. This should allow for sufficient drainage channel dimensions, and capacity for siltation management solutions;

ii. There will be no direct discharge from constructed drainage measures into watercourses. As such, sedimentation and silt mitigation measures will be adequately designed and positioned such that no silty water or pollution of any kind is permitted to enter watercourses directly from constructed drainage measures;

iii. There will be no stockpiling of materials within 50m of a watercourse or a private water supply. Where this is not possible, no less than 20m may be permitted with the express permission of the ECoW; and

iv. Reinstatement of temporary drainage and silt mitigation measures will be undertaken as required as soon as possible after the completion of excavations.

1.3.4 The *Contractor* will also take into account the requirements of Technical Schedules TS2: Pollution Prevention Plan, TS5: Watercourse Crossing Plan, and TS9: Environmental Incident and Emergency Response Plan in preparing his detailed DMP. Reference documentation referred to in all of these Technical Schedules is relevant to drainage control.

2 GENERAL DRAINAGE CONTROL REQUIREMENTS

2.1 Monitoring & Records

2.1.1 To ensure all drainage measures put in place for the construction phase of the works are maintained and continue to be effective, monitoring will be carried out. To ensure compliance of the construction works with this DMP and the *Contractor*'s detailed DMP, drainage management works will be supervised by the ECoW. The Planning Monitoring Officer (PMO) may also inspect the construction works as required on behalf of the local authority. The *Contractor*'s Environmental Manager / Engineer or other suitably qualified person(s) will be tasked with undertaking monitoring duties.

2.1.2 All monitoring and environmental checks will be undertaken in accordance with the requirements detailed within Section 3 of the SEMP. Records of all monitoring undertaken on drainage mitigation measures will be kept as per the requirements of Section 4 of the SEMP.

2.1.3 Independent water quality monitoring of surface water catchments and private water supplies in the vicinity of construction works will be undertaken as per the requirements of TS6. This monitoring will serve to identify impacts to water courses and supplies which may occur as a result of insufficient silt mitigation or poor drainage design.

2.1.4 Prior to commencement of the construction works in an area, an on site meeting / inspection will be carried out by the *Contractor* and the ECoW to confirm the final drainage design (temporary or permanent) and appropriate use of identified silt mitigation measures. Particular attention will be paid to drainage and silt mitigation designs in the vicinity of the sensitive areas noted in Section 1.21.2.

2.1.5 Inspection of drains and any erosion, silt or sediment control measures should be made before, during (where safe to do so) and immediately following anticipated storm events or periods of continuous or heavy intermittent rainfall over one or more days. Regular checks will be made at least every 14 days.

2.2 Emergency Spill Response

2.2.1 Drainage networks provide a conduit for rapid transport of silty water and potentially contamination from surface spills of fuels / oils, concrete or chemicals.

2.2.2 For the purposes of emergency response planning, the detailed DMP will identify:

- drainage flow paths (including links to existing drainage networks at the site) and potential direct connections with any surface water course or natural spring / flush area; and
- areas where spill kits and drainage stops and diversions may be implemented in an emergency to prevent release of contaminated drainage waters.

3 DRAINAGE MITIGATION: GENERAL PRINCIPLES AND STRUCTURES

3.1 Clean Water Diversion

3.1.1 Where possible at all construction works areas, clean water (i.e. non-silty surface water flow that has not yet passed over any disturbed construction areas) will be kept separate from silty water or other potentially contaminated water. Where appropriate, up-gradient cut off ditches and other drainage diversion measures should be installed in order to collect and divert up-gradient surface water runoff from construction disturbed areas. These measures should be installed ahead of actual construction and excavation works wherever practical. This will reduce the flow of water onto any exposed areas of rock and soil, thereby reducing the amount of potential silt laden run off requiring treatment.

3.1.2 Clean runoff water should be discharged into an area of vegetation for dispersion or infiltration. Silt traps, gravel, sand bags, silt fencing and anchored straw bales may be required at the discharge point in order to prevent erosion at the outlet, alleviate flow and aid in flow dispersion across a wider area of vegetation to prevent potential scour and remobilisation of deposited silt.

3.1.3 Discharge points will be located sufficient distance from any water courses to allow adequate infiltration or settlement of suspended solids prior to any discharged surface run-off potentially entering the water course.

3.2 Silt Mitigation and Settlement Ponds

3.2.1 Silt laden run off should be expected from any areas of recently exposed soil or rock. This silt laden run off will be captured and directed via berms or ditches towards specially constructed sediment control structures.

3.2.2 Sediment control structures may comprise a series of settlement ponds with additional incorporated filtration measures where required. Typical details of a settlement pond are indicated on Figure TS4-1. Additional filtration measures may include flow attenuation measures such as weirs, rock bars and / or anchored and embedded straw bales within ponds or between series of ponds.

3.2.3 The number, location and dimensions of settlement ponds, plus requirements for flow attenuation measures will depend on the volume of water requiring treatment, silt load characteristics, topography and access constraints.

3.2.4 The use of synthetic liners within settlement ponds will be avoided in order to reduce the impacts from disturbance of silt during liner removal and reinstatement of ponds on completion of construction works. The exception to this may be where the pond is dug into very silty or clayey mineral soil substrate which may adversely contribute a significant silt load to the settlement pond, or where impermeable liners are required to prevent risks to underlying groundwater from infiltration of contaminated water from the pond (e.g at settlement ponds associated with concrete wash out pits).

3.2.5 Native materials (peat turves, soil bunds, clean rock aggregate etc) will be used in preference to artificial or 'foreign' materials in construction of any silt mitigation measures. Any introduced or artificial materials required for temporary erosion or silt mitigation controls, such as silt fencing, straw bales, sand bags etc are required to be removed upon completion of construction works. Silt mitigation measures will be implemented during removal of these materials as disturbance may be caused in drains and ponds which have since bedded in.

3.2.6 Final discharge from any settlement pond will be over vegetated ground (with exceptions, e.g. blanket bogs). Silt fences or other flow attenuation measures may be required at the discharge point in order to disperse the discharge and prevent build up of settled solids which could be subject to remobilisation.

3.2.7 Settlement ponds will be designed and constructed with sufficient capacity to allow settlement and allow contingency for unexpected increased rainfall events. Contingency measures may include additional capacity within an existing pond, or identification of additional areas within the vicinity which may be suitable for creation of additional ponds.

3.2.8 In the event that the natural or excavated ground profile in any area of the site does not lend itself easily to construction of an adequate settlement pond(s), water should be directed towards a sump area prior to being pumped away to a suitable settlement pond(s) or vegetated area with adequate silt mitigation measures well away from sensitive habitats or water courses.

3.2.9 Siting of settlement ponds will take into consideration access requirements for reinstatement and maintenance (for example: periodic silt removal, expansion of ponds or incorporation of additional silt mitigation measures etc). Additional temporary silt mitigation measures may be required during maintenance and reinstatement activities.

3.2.10 Where water depth within settlement ponds has the potential to exceed 0.5m, the perimeter of the ponds will be demarcated by safety fencing and appropriate warning signs.

3.3 Drains and Check Dams

3.3.1 Where possible, drains should be constructed so that the gradient does not exceed 2º in order to slow flows, prevent erosion of the drain base and sides, and encourage establishment of terrestrial and aquatic vegetation where possible. Where this is not possible, sufficient flow attenuation measures will be installed.

3.3.2 The width and depth of constructed drainage channels will be minimised as far as practical in order to reduce ground disturbance, excavation footprint (and hence volume of excavated materials) and also disruption of local hydrology as far as possible. In peat, drainage channels should avoid penetration into the catotelmic layers where ever possible. However, drainage channels and associated pipes will require to be as wide as practical to allow wildlife to safely enter/exit the channel/pipe. SNH in their formal response to the original Viking Wind Farm application (letter of 24 July 2009) noted the following recommendations for ecological provision in relation to drainage (refer to TS8, Ecological Protection Plan for further information):

- "*As otter pass through some of the proposed development site, SNH recommends a condition of planning that at the end of each day, pipe ends should be covered to prevent otters from entering pipes and becoming trapped and planks should be placed*

in excavations and other construction holes to allow otters to climb out so they do not become trapped".

3.3.3 Temporary or permanent check dams (flow barriers or dams constructed across the drainage channel) will be installed at regular intervals within any clean water or dirty water cut off ditches. Typical details of check dams are provided on Figure TS4-1. Check dams are required in order to reduce the velocity of water and therefore allow settlement of coarser sediment particles as well as silt at low flow conditions. Reduction in flow velocity will also prevent scouring of the drainage channel itself.

3.3.4 Check dams are ideally constructed of clean hard rock aggregate (ideally gravel or cobble sized depending on the volume and velocity of flow and size of the channel), although sand bags and anchored and embedded straw bales may also be deployed in the short term. The number and location of check dams will be dependent on the slope, flow and volume of water, although the following general rules will be applied:

- The maximum spacing between check dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam;
- The centre of the check dam should be at least 0.2m lower than the outside edges;
- Side slopes should be 2:1 or less;
- Check dams should be keyed at least 0.1m into the drainage channel bottom in order to prevent the dam washing out; and
- Temporary sand bag or straw bale check dams should also be keyed / embedded into the base and sides of the drainage channel, staked and tied together, and provide an overflow weir in the centre to concentrate flow away from the sides of the drainage channel.
- Straw bales and sand bags may only be used as a temporary flow attenuation measure and all bales and bags will be removed and replaced with permanent measures upon completion of construction works. Straw bales will be monitored regularly for effectiveness in flow attenuation and decomposition. Decomposing or fragmenting straw bales will be removed and disposed of appropriately and alternative flow attenuation measures replaced as required.

3.3.5 Silt traps will be installed where required (and where practical for maintenance purposes) at intervals along drainage channels. Silt traps will also be constructed at the inlet and outlet of any pipe culverts to prevent the pipes becoming blocked and prevent erosion at the inlet and outlet points.

3.3.6 Check dams and silt traps should be maintained and monitored on a regular basis. Sediment should be removed before it reaches one half the original dam height or silt trap depth.

4 TRACKS AND WATERCOURSE CROSSINGS

4.1 General

4.1.1 As noted previously, clean water and dirty water should be kept separate where possible on site and in particular during construction activities. A schematic representation of how this may be achieved adjacent to tracks and at water course crossings is provided on Figure TS4-2. Additional details on typical trackside drainage arrangements are provided on Figure TS4-3.

4.1.2 Ecological design requirements noted in Section 2.3 will be considered in all trackside drainage.

4.2 Cut tracks

4.2.1 Where practical, up gradient 'clean' surface run off will be separated and diverted from any surface run off which is in contact with road surfaces or any other areas with exposed soil. Any silty water generated will ideally be channelled into separate down slope drains.

4.2.2 Silty and clean water drainage will be channelled separately to vegetated areas at least 50 metres from watercourses to allow the settlement of solids. Where settlement over vegetation is not ecologically sound (e.g. involving intact blanket bog, requiring only rain-fed nutrients), or is not practical or adequate to deal with the volume of silt generated, silt traps or settlement lagoons will be utilised and monitored to ensure stored surface water is kept to a minimum.

4.2.3 Particular care will be taken to control silt laden drainage within the vicinity of any water courses or existing drainage ditches. As per the requirements of TS5, splash boards and run-off diversion measures, including silt fencing adjacent and parallel to water courses beneath bridges and at culvert crossings, will be used at all crossings to prevent direct siltation of watercourses. Silt mitigation measures will be installed manually where possible to minimise disturbance.

4.2.4 Cross drains will be installed at regular intervals for up slope drainage in order to reduce flow volume within the main upslope drain and reduce loading on any particular discharge point. Cross drains will be installed as pipe culverts under the track surface. The frequency of cross drains should increase in areas where higher flows are anticipated such as: steeper gradients; in areas of high surface flow (e.g. flushes in bog areas); where bank seepages are noted; and where historical land drains are intercepted. Each cross drain will require a silt trap at each end, large enough on the lower side to hold pollution prevention absorbent booms.

4.2.5 Pipe culverts used for cross drainage will be long enough so that road fill does not extend beyond the end of a culvert. Cross drain culverted pipes will be constructed at grades at least 2% more than the ditch grade and angled 30 to 45 degrees cross-track to improve inlet efficiency. Check dams will be installed immediately above a cross drain inlet and silt traps are required at the inlet and outlet points to prevent blockage of the pipe due to silt build up as well as erosion and undercutting at the ends of the culverted pipes.

4.3 Floating tracks

4.3.1 The recently published guidance "Floating Roads on Peat" (Scottish Natural Heritage & Forestry Civil Engineering, August 2010) provides detailed information relating to drainage associated with floating roads.

4.3.2 The aggregate size at the base of the track foundation should be such that it is permeable to at least the extent of the underlying organic soil / peat to allow flow through of water and, if necessary, there should be a geotextile layer to prevent fines from blinding the foundation layer. Thus, although there may be some compaction there will be no impediment to lateral seepage below the full length of the road.

4.3.3 Where springs or flushes flow diffusely across the peat surface. In these instances, drainage ducts beneath the tracks may be required to maintain hydrological equilibrium of the underlying peat. Where hydraulic continuity is severed, erosion of the upslope road edge may occur and changes in water tables either up slope or down slope can have a negative effect on peat stability. Drainage ducts (pipes) will therefore be installed beneath floating track sections at a minimum of 100m centres, or more frequently as required, where mire or flush areas are crossed or the track passes through an area of potential peat instability.

4.3.4 If ditches are required to be installed post-construction of the road, to minimize any drawdown of the water table below the road and any consequential settlement ditches should be installed sufficiently far away from the road and will be shallow enough to limit the local lowering of the groundwater in the peat as much as possible. Ditches should avoid penetration of the catotelmic peat where ever possible.

4.3.5 Where drainage paths or peat pipes are detected at or near the surface of the peat they should be taken through or under the floating road in a permanent drainage pipe. The size of the pipe should be sufficient to accommodate the expected flow through the drain / peat pipe and hung in a geogrid below the floating road.

4.3.6 The final design of drainage associated with floating roads will be determined prior to commencement of works in any area of the site in agreement with the ECoW and Geotechnical Consultant / Clerk of Works.

4.3.7 The following negative environmental effects must be minimised: erosion of the road surface; silt dispersion across a wide area of peat; and silt entry into peat gullies and natural hydrological channels. These effects can be avoided by constructing road camber and raised verges such that surface flow is directed towards constructed silt traps and other silt mitigation measures as required.

5 BORROW PITS

5.1.1 Schematic representation of a typical borrow pit drainage arrangement is provided on Figure TS4-4.

5.1.2 Overburden will be stripped and stored on the up-gradient side of the borrow pit, sealing in all mineral material with a covering of peat to minimise wash out of silt. The height of the storage bund will be dependant on the stability of the stored material and the ground beneath. Proposals for storage of overburden material must be checked and approved in advance by the site Geotechnical Clerk of Works.

5.1.3 Consideration should be given to minimising erosion and run off from the overburden stock piles. A silt fence should be installed on the down-gradient side of the stockpile.

5.1.4 An up-gradient cut off ditch should be installed around the edge of the storage bund above the borrow pit in order to collect up-gradient surface water runoff and divert water runoff from eroding the bund foot. This will eliminate or reduce the flow of water onto the exposed rock and soil faces and into the worked quarry floor, thereby reducing the amount of potential silt laden run off to be treated. For health and safety reasons, and to avoid significant erosion of ditches on steep gradients, where the up-gradient perimeter and sides of borrow pits are on steeply sloping ground the cut off ditch may only be installed where safe and practicable.

5.1.5 Clean runoff water from cut off ditches should be discharged into an area of vegetation for dispersion or infiltration. Silt fencing and anchored straw bales may be required at the discharge point in order to alleviate flow and aid in flow dispersion across a wider area of vegetation to prevent potential scour.

5.1.6 Due to the exposed soil and rock faces and worked quarry floor, silt laden run off should be expected from within the confines of the borrow pit and also from the access track leading down to the borrow pit.

5.1.7 Silt laden run off will be captured and directed via berms or ditches towards specially constructed sediment control structures. Sediment control structures may comprise a series of settlement ponds with additional incorporated filtration measures where required.

5.1.8 In the event that the natural or excavated ground profile does not lend itself easily to capture and diversion of run-off towards the settlement pond area, water within the borrow pit should be directed towards a sump area prior to being pumped into the ponds.

5.1.9 Consideration should be given to the location of any aggregate or overburden stock piles such that erosion and run off from the stockpiles is limited. A silt fence should be installed on the down-gradient side of the stockpile and an up-gradient ditch to divert water runoff from eroding the base of the stockpile and collecting further sediment.

6 OTHER INFRASTRUCTURE

6.1 Turbine Foundations and Crane Hardstandings

6.1.1 Schematic representation of a typical turbine base and crane hardstanding drainage arrangement is provided on Figure TS4-5.

6.1.2 Foundation excavations for turbines are generally below the level of the surrounding ground and hence surface water ingress from up slope or groundwater seepage may occur, leading to standing water within the base of the excavation.

6.1.3 Prior to commencement of each foundation excavation, the *Contractor* will assess the local gradient and the potential risk of silty run-off exiting the base area and design appropriate sediment control and silt mitigation measures accordingly. The site investigation details for all recorded soils should be considered, especially the potential presence of clay, silt and mixed unconsolidated sediments as these are most likely to generate significant volumes of suspended solids within run off once excavated.

6.1.4 Overburden will be stripped and stored on the up-gradient side of the turbine base and crane hardstanding, sealing in all mineral material with a covering of peat to minimise erosion, run off and wash out of silt. If necessary, a silt fence should be installed on the down-gradient side of the bund.

6.1.5 An up-gradient cut off ditch should be installed around the edge of the storage bund above the deep excavation in order to collect up-gradient surface water runoff and divert water runoff from eroding the bund foot. This will eliminate or reduce the flow of water into the deep excavation, thereby reducing the amount of potential silt laden run off to be treated.

6.1.6 Where the topography allows, foundation excavations will be designed to be gravity draining in order to facilitate egress of surface water from the excavation. Where this is not possible, a sump should be created from which water can be pumped into an appropriate sediment control structure.

6.1.7 Up slope cut off ditches will be constructed to minimise surface water ingress into the excavation area.

6.1.8 Diversion dams / berms will be constructed accordingly in order to channel silty run-off water into the 'dirty' water drainage system for discharge into a suitable sediment control structure.

6.2 Construction Compounds, Substation and Control Buildings

6.2.1 Schematic representation of a typical drainage arrangements around construction compounds and substation control building excavations are provided on Figure TS4-6.

6.2.2 During construction works large areas of soil may be exposed at the site of the construction compounds and substation / control building construction footprints. As with tracks and borrow pits, clean up-slope run off and run off from the exposed construction area will be kept separate and appropriate silt mitigation measures will be deployed.

6.3 Peat Storage and Reinstatement Works

6.3.1 Consideration should be given to the location of any peat storage areas such that no significant risks are presented to humans or the environment (including livestock or wild animals). In particular, erosion and run off will be limited and leachate from the peat material will be controlled and the stability of the existing peatland in the vicinity will not be affected.

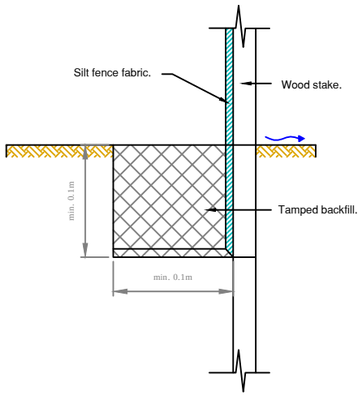
6.3.2 Similarly, consideration should be given to the impacts of poor drainage control in any areas where peat is used in reinstatement, for instance track verges, reinstatement of construction compounds, restoration of borrow pits etc.

6.3.3 Up slope cut off ditches, down slope drainage collection systems, containment berms (keyed-in where appropriate), and appropriate drainage mitigation measures will be required as with other infrastructure described above.

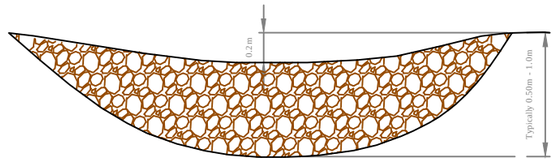
6.3.4 The design of any peat storage and reinstatement works, including incorporated drainage elements, will be agreed with the ECoW and Geotechnical Consultant / Geotechnical Clerk of Works prior to works commencing.

6.3.5 If any longer term storage is proposed (e.g. associated with material required for decommissioning of the wind farm) the detailed proposals will be agreed with the ECoW and Geotechnical Consultant / Geotechnical Clerk of Works and SEPA.

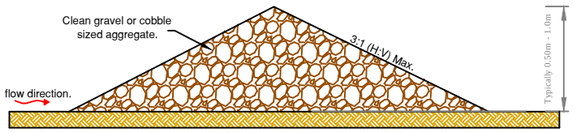
Silt Fence Detail.



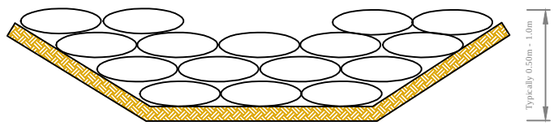
Rock Check Dam Elevation.



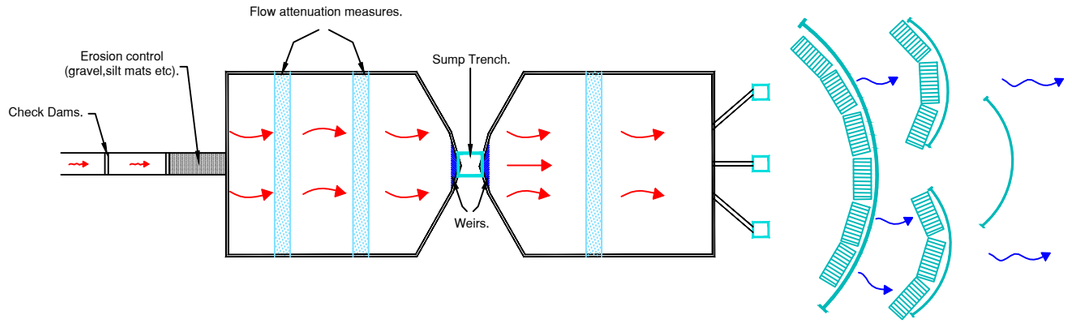
Rock Check Dam Section.



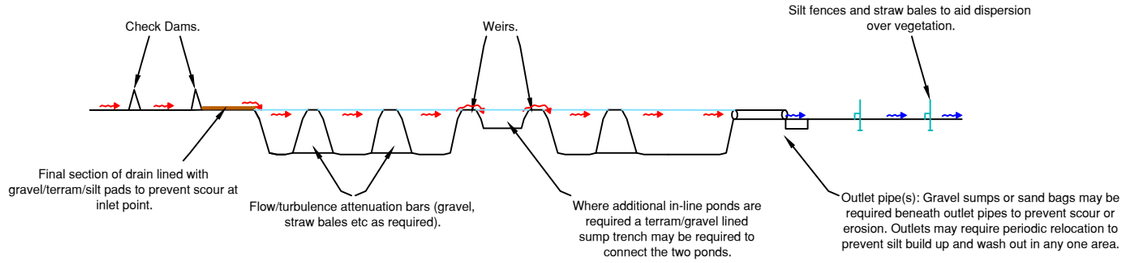
Sand Bag Check Dam Elevation.



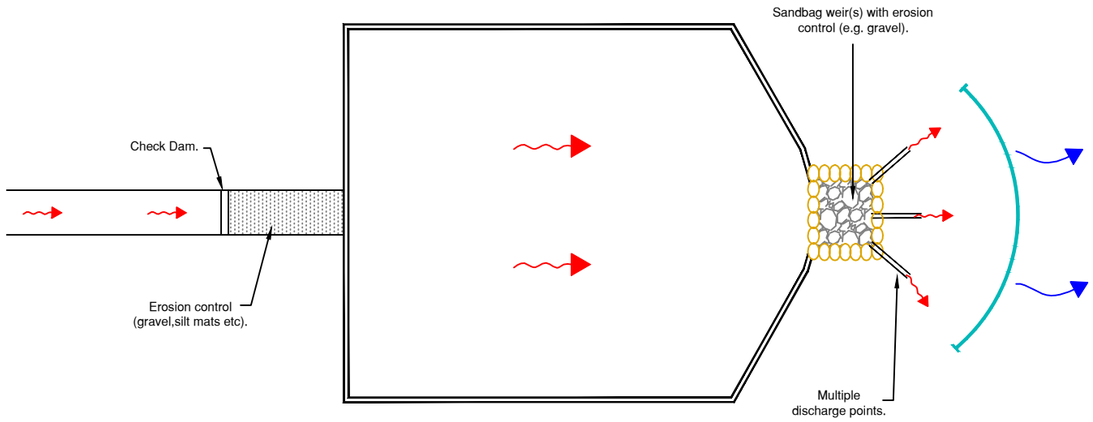
Plan View: In-line Settlement Ponds (typical for higher flow, higher silt load conditions).



Schematic Section: In-line Settlement Ponds.



Plan View: Single Settlement Pond. (Typical for low flow, low silt, load conditions).



NOTES

Silty water

Clean water

Notes

1. Dimensions and number of settlement ponds or requirements for flow attenuation measures will depend on volume and velocity of water and silt load chracteristics.

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

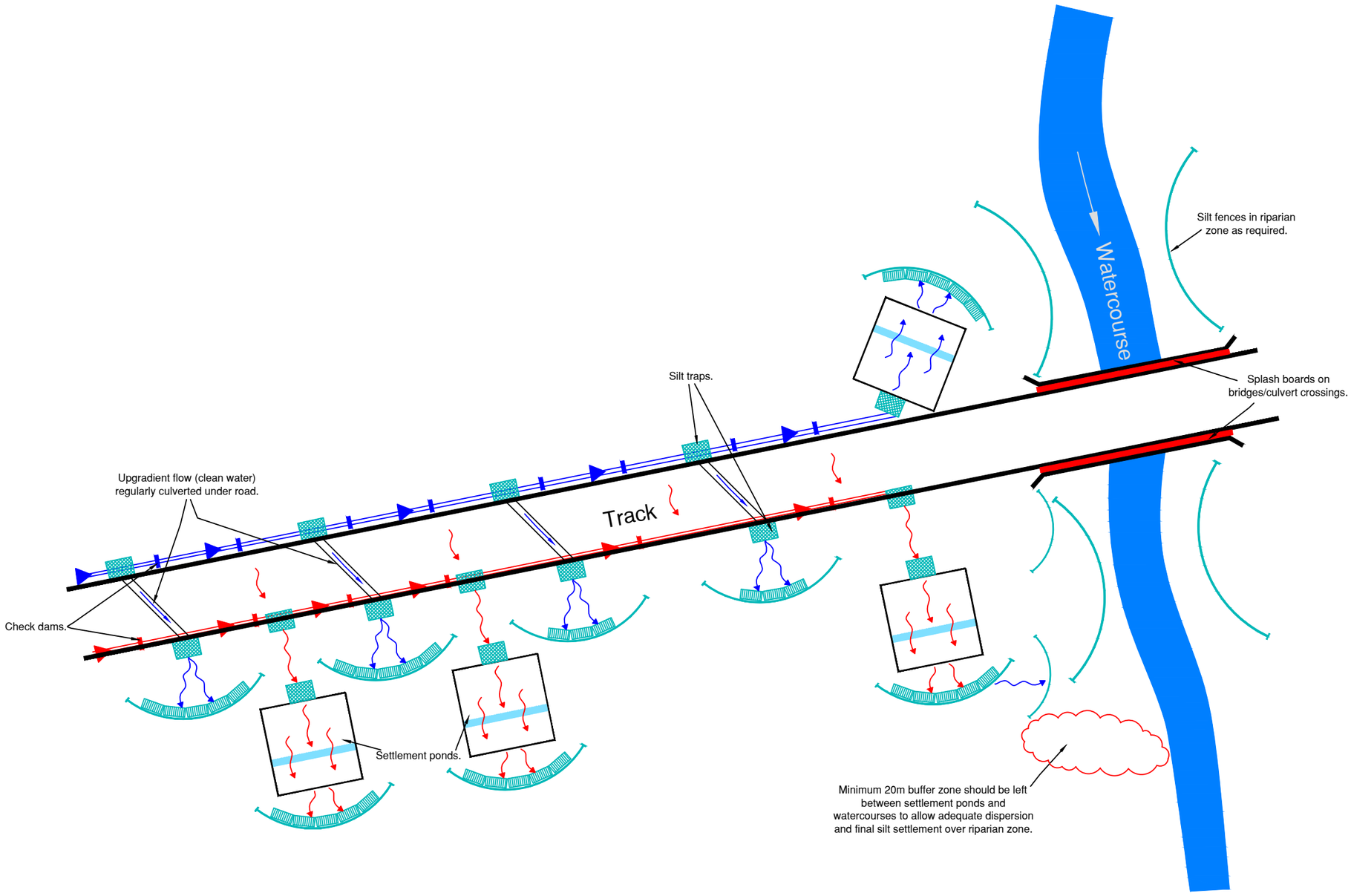
DRAWING TITLE

TYPICAL DETAILS OF SETTLEMENT PONDS AND SILT MITIGATION MEASURES

DRAWN BY	CHK'D BY	APP'D BY	DATE	SCALES
DB			14/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
	FIGURE 1	

viking energy
Harnessing Shetland's natural resources



NOTES

Silty water

Clean water

Silt trap

Silt fence and straw bales

Notes

1. In order to reduce volumes of potentially silty laden run-off, 'clean' (upgradient) surface run-off to be kept away from exposed soil areas and seperated from construction works run-off where possible.

2. Typical details for settlement ponds, check dams and silt fences are shown in Figure 01.

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

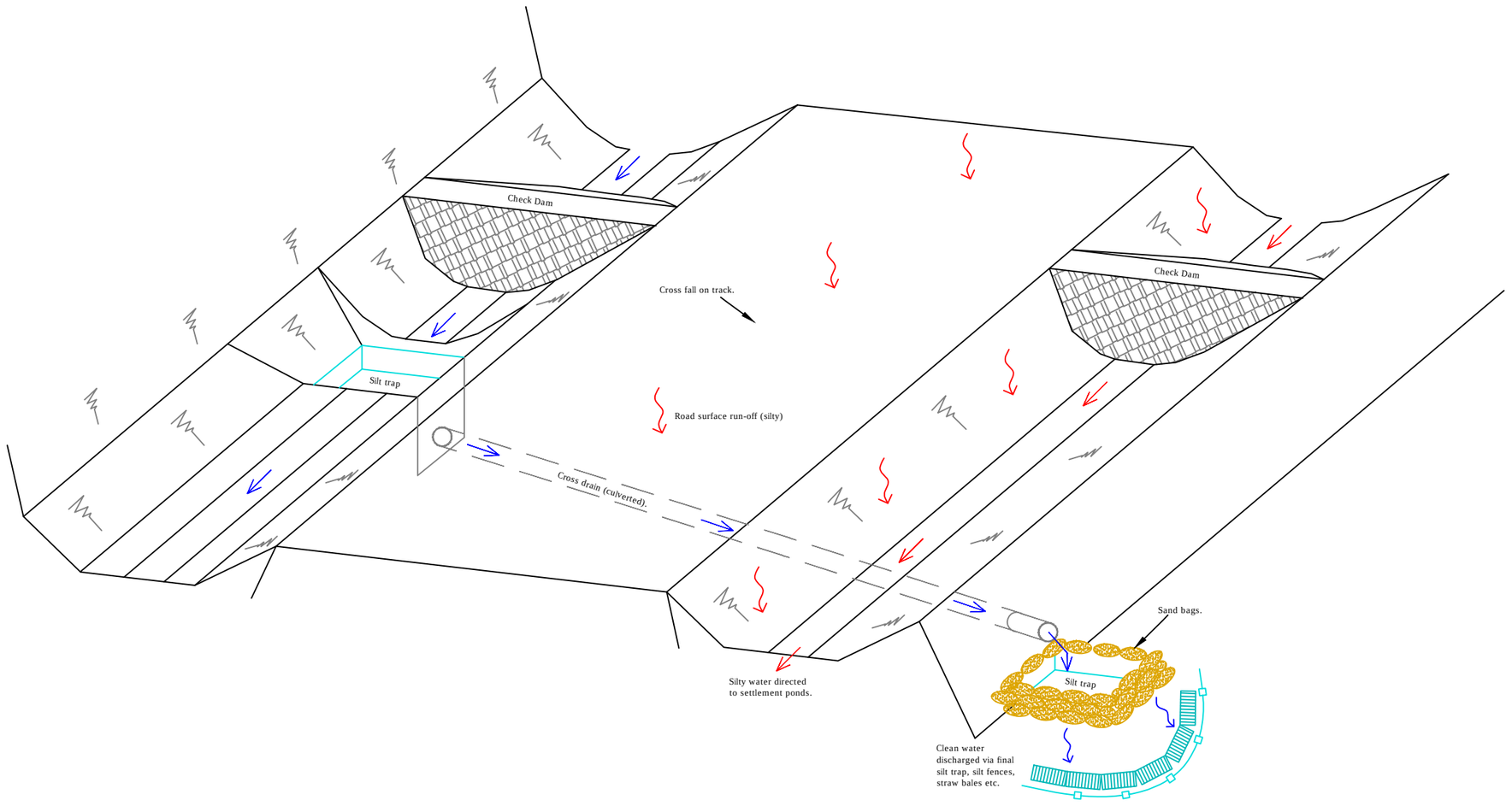
DRAWING TITLE

SCHEMATIC DRAINAGE ARRANGEMENTS FOR TRACKS AND WATERCOURSE CROSSING

DRAWN BY	CHK'D BY	APP'D BY	DATE	SCALES
DB			13/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
	FIGURE 2	

viking energy
Harnessing Shetland's natural resources



NOTES

Notes

1. Refer to Figure 01 for typical details of settlement ponds, check dams and silt fences.
2. Refer to Figure 02 for further details on track drainage arrangements.
3. Where topography or other constraints preclude the segregation of clean / dirty water drainage (as illustrated on this drawing), the road surface cross fall shall be towards the upslope drainage ditch. Flow rates and volumes within such a combined drainage system may be higher and therefore sediment and silt attenuation measures shall be implemented accordingly to control expected increase in flow, erosion and sediment / silt load.

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

DRAWING TITLE

SCHEMATIC SECTION OF TYPICAL CUT AND FILL TRACK DRAINAGE ARRANGEMENTS

DRAWN BY	CHK'D BY	APP'D BY	DATE	SCALES
DB			13/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
	FIGURE 3	

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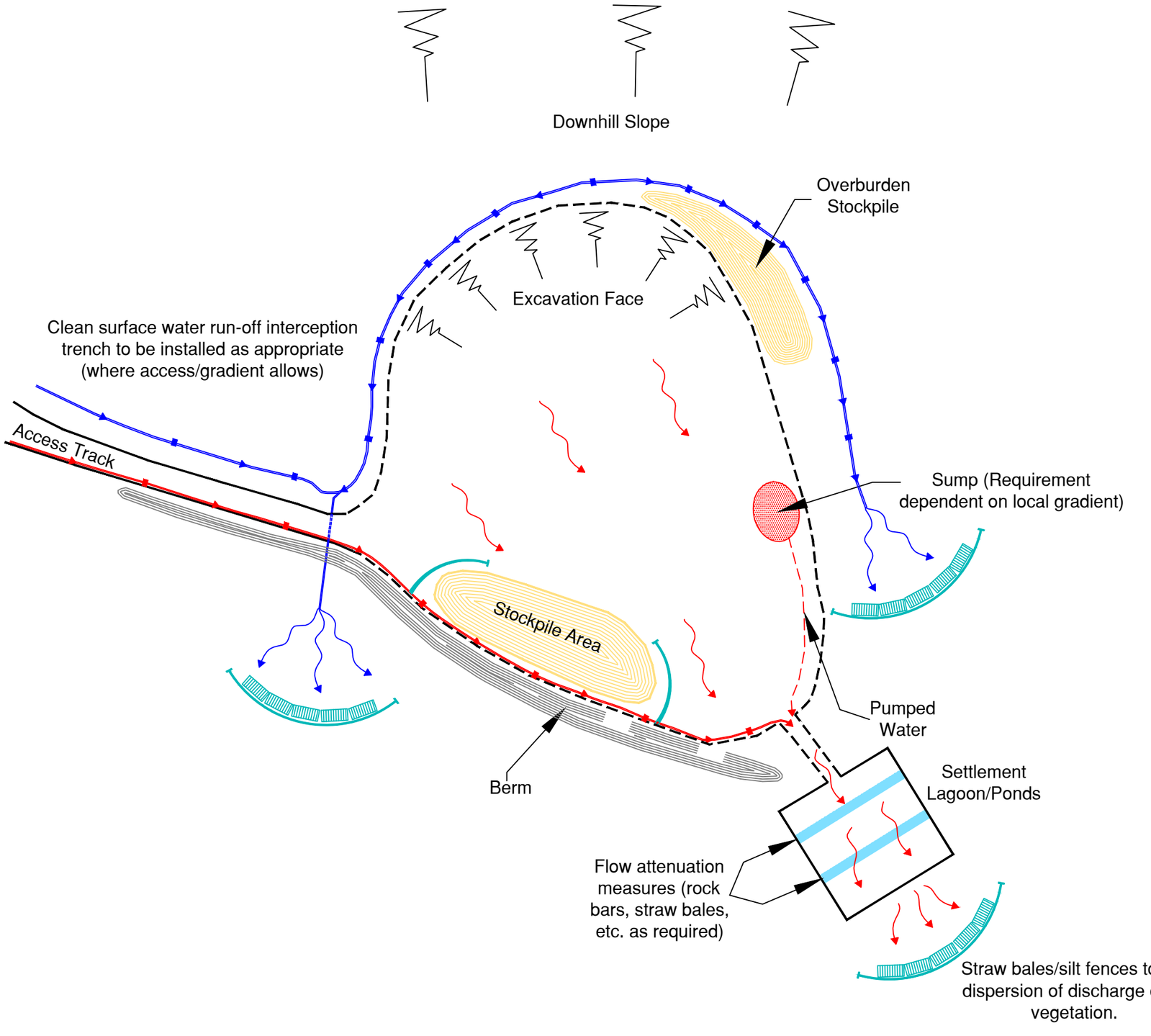

NOTES

- Borrow pit boundary
- Potentially silty run-off/drainage
- Check dams
- Clean water run-off/drainage
- Silt fence and/or straw bales to aid dispersion (and protect stockpile)

1. Borrow pit configurations will vary from that indicated on this drawing (for instance borrow pits are likely to be off-line of continuing access tracks); However, the general principles of clean / dirty water drainage segregation, stockpile erosion and run off control, and general sediment and silt control shall apply irrespective of the final borrow pit configuration.

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

DRAWING TITLE

SCHEMATIC BORROW PIT DRAINAGE ARRANGEMENTS

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DB			14/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
G2009/230	FIGURE 04	

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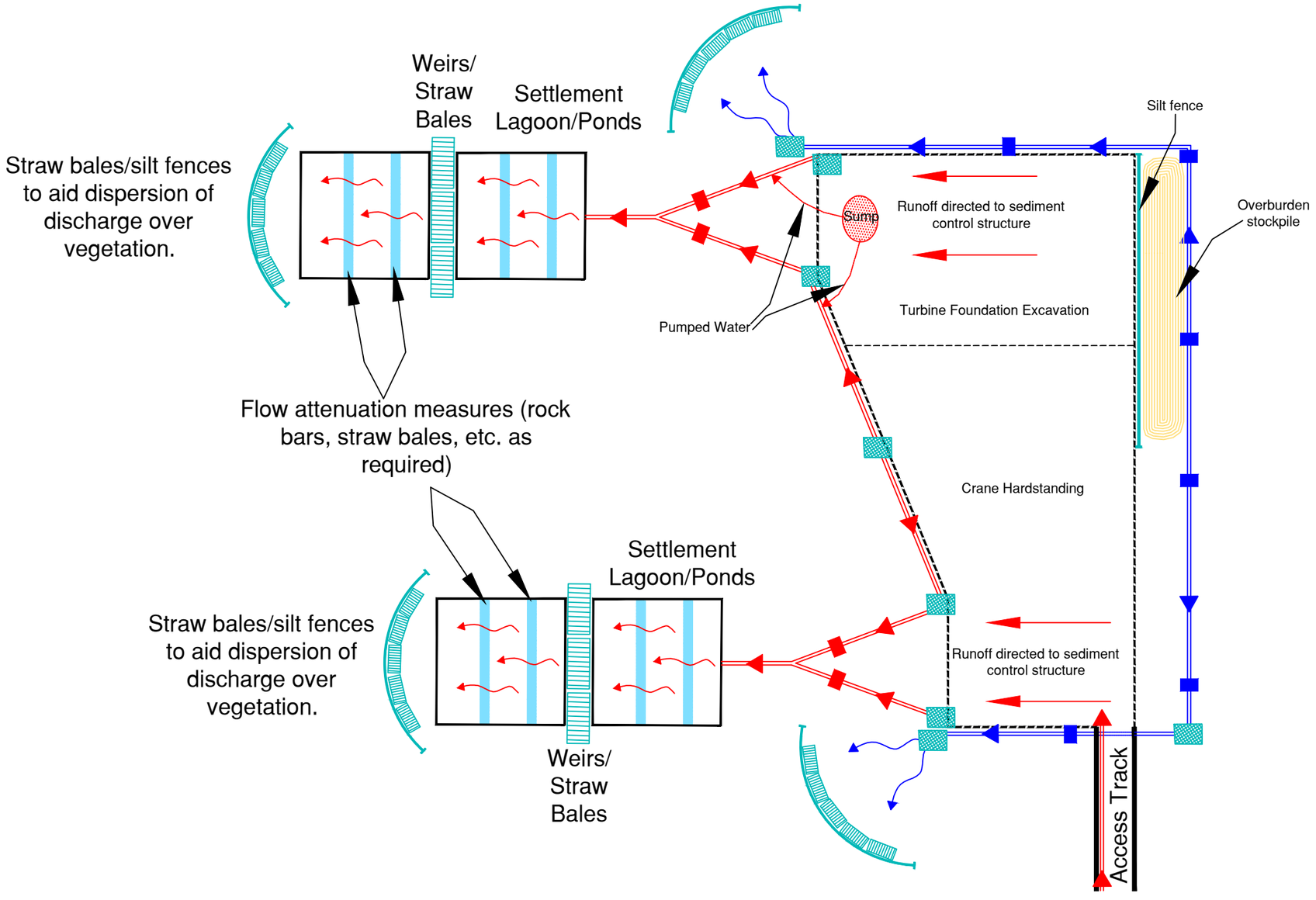

NOTES

- Potentially silty run-off/drainage
- Clean water run-off/drainage
- Silt fence and/or straw bales to aid dispersion (and protect stockpile)
- Check dams
- Silt traps

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

DRAWING TITLE

SCHEMATIC DRAINAGE ARRANGEMENTS FOR TURBINE BASES AND CRANE PADS HARDSTANDINGS

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DB			15/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
	FIGURE 5	

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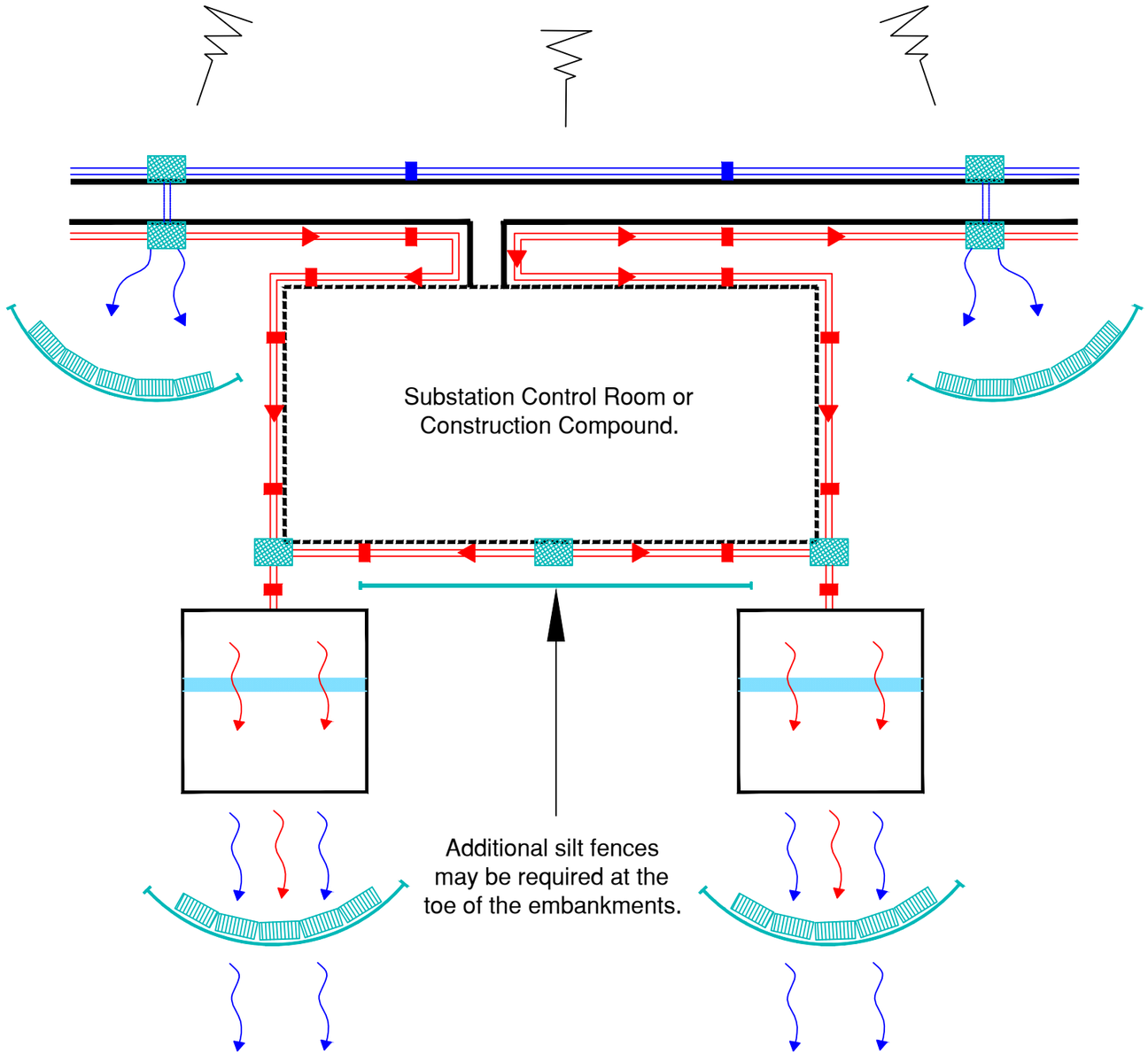

NOTES

- Potentially silty run-off/drainage
- Clean water run-off/drainage
- Silt fence and/or straw bales to aid dispersion (and protect stockpile)
- Check dams
- Silt traps

REV	DATE	DETAILS

PROJECT TITLE

FRAMEWORK DRAINAGE MANAGEMENT PLAN

DRAWING TITLE

SCHEMATIC DRAINAGE ARRANGEMENTS FOR SUBSTATION CONTROL ROOM

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DB			15/10/09	N.T.S.

PROJECT No.	DRAWING No.	REVISION
	FIGURE 6	

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