Ledcharrie Hydro Scheme

Construction Method Statement

Document Number D045-202

Version 0.2

Version Record

Version	Date	Comment
0.1	30/06/15	First draft for review
0.2	5/8/15	Draft for issue to permitting bodies

Document Plan

Planning and CAR references are shown to ensure that all relevant issues are addressed.

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INTRODUCTION

1.1 Scope of Document

This document details environmental mitigation measures and construction method statements, including specific measures for environmental monitoring during construction of a small hydroelectric scheme at Ledcharrie, Glen Dochart, Crianlarich.

Section 8 of this document specifically addresses surface water management and water pollution issues.

1.2 Supporting Documents

The following documents should be read in conjunction with this document:

[1] Site plan D045-001 dated 150511
[2] Hydro scheme construction standards and guidance, D000-001, Glen Hydro

2 PROJECT DESCRIPTION

2.1 Scope of Project

The project consists of the following work packages:

- Infrastructure works and access track works, including:
  - Clearing and fencing the laydown area
  - Upgrading the site access track, leading form the farm to the powerhouse site
  - Preparing the hill access tracks to the intake sites
- Civil works, including:
  - Site preparation for intakes
  - Construction of two intakes with associated settling tanks
  - Construction of a pressure pipeline comprising HPPE pipe below the intakes and the lower section which will be ductile iron
  - Site preparation for powerhouse
  - Construction of a powerhouse
  - Construction of a tailrace and outfall structure
  - Pipeline commissioning
- Mechanical and Electrical works associated with the powerhouse, including:
  - Mechanical installation of turbine, generator, switchgear and control system
  - Electrical installation of control system and power export system within powerhouse
  - Electrical installation of building services within powerhouse
  - Earthing network installation
  - Commissioning of mechanical and electrical works
- Grid connection works
  - Extension of overhead line
  - Laying of buried cable to powerhouse location
  - Installation of transformer adjacent to powerhouse

The site layout and location of the structures is shown on the site layout plan at Appendix [1].

2.2 Project Organisation

2.2.1 Project Structure

The project is to be delivered by the use of the following contractors:

- Civils contractor as the Principal Contractor, responsible for all civil works and health and safety for entire site
- M&E contractor, responsible for the M&E works in the powerhouse
- Electrical contractor, responsible for the electrical works on site
- SSE as the Distribution Network Operator, responsible for the grid connection works

2.2.2 Main Stakeholders

The main stakeholders involved in the project are listed below. The emergency contacts are highlighted in bold.

Organisation	Interest	Name	Number
LL&TNPA	**Planning authority**	**Catherine Stewart Nicola Arnott**	[redacted]
SEPA	**Consenting authority**	**Gail Castle**	
SSE	Grid operator	Atif Haq	
Auchlyne Estate	Landowner	Henry Paterson	
Glen Hydro Development	Client and developer	Richard Haworth	

2.2.3 Project Delivery Team

The main parties involved in the delivery of the project are listed below. Emergency contacts are highlighted in **bold**.

Responsibility	Organisation	Name	Number
Client and Project Manager	**Glen Hydro Development**	**Richard Haworth**	[redacted]
Designer	Hydropol	Michal Arnold	
CDM Coordinator (if required)	John Morris Safety Ltd	John Morris,	
Principal Designer	Glen Hydro Development	Richard Haworth	
Ecological Clerk of Works	**Diverse Ecology**	**Fiona MacLennan**	
Principal Contractor	**Glen Hydro Development**	**Richard Haworth**	
M&E Contractor	Hydropol	Michal Arnold	
Electrical Contractor	TBC	TBC	

2.2.4 Project Delivery Team Roles and Responsibilities

2.2.4.1 Project Manager

- Liaison with client & designers during the detailed design stage to ensure that all planning conditions are met. During construction, site visits will be scheduled according to specific project duties.
- Overall responsibility for ensuring that the action of each party accords with their responsibilities and for implementing such corrective measures as may be needed.
- Ensuring that any pollution incident is promptly reported to SEPA and other parties as agreed.

2.2.4.2 CDM Coordinator

- Appointed under Construction (Design and Management) Regulations 2007 and responsible for preparation of pre-construction Information and the Health & Safety File.
- Provision of advice on suitability of the contractors construction phase Plan.
- Delivery of the Health & Safety File to client.

2.2.4.3 Principal Contractor

- Ensure that all contract conditions are adhered to including:
  - The works are carried out according to the specifications and drawings supplied.
  - Instructions issued by the Project Manager and the ECoW will be actioned,
  - All statutory duties such as for Health & Safety on site are followed

- Maintaining site records and diaries
- Reports on site visits by the design team and the project manager and the ECoW
- The display of Notices as per statutory regulations.
- The principal contractor will carry out all forms of silt mitigation works

- A condition of the construction contract will be that the principle contractor shall comply with the approved Environmental Management Plan / Construction Method Statement.
- The principal contractor will ensure that any pollution incident is promptly reported to SEPA without delay.

2.2.4.4 Designer

- Responsible for all design work associated with the hydro scheme
- Regular inspections of the work being undertaken by the contractor(s) and reports to the Project Manager.

2.2.4.5 Ecological Clerk of Works (ECoW)

- Appointed in accordance with Condition 15 of the planning permission.
- Ensures adherence to all environmental-related recommendations in Planning Conditions, SEPA's CAR Licence and in statutory legislation, also any site specific policies specified in the ER which may not be embodied in those regulations.
- Coordinate environmental and landscape aspects of the project on behalf of the developer in accordance with the Ecological Scope of Works as agreed by the Planning Authority under Condition 16 of the Decision Notice.
- The ECoW has the power to stop construction work as required or necessary to carry out her work effectively.
- The ECoW will report regularly to SEPA and the Planning Authority as required.
- Further detail is contained throughout this CMS.

2.3 Permissions and Conditions

The following permissions apply to the project:

- Planning consent: Loch Lomond & The Trossachs National Park Authority Decision Notice 2013/0047/DET
- CAR licence: CAR/L/1107772
- CAR registrations: CAR/R/XXXX (TBA - applied for)
- Lease of land with landowner – Glen Hydro Ledcharrie Ltd

The planning permission for the project is the subject of 18 Conditions. The contents table on page 3 notes which conditions are addressed by this CMS. Other Conditions have been addresses directly with LL&TNPA and their consultees, and are referenced as appropriate in this document. SEPA CAR Conditions are also noted in the contents table as many are linked with the Planning Conditions.

2.4 Programme of Works and Key Timings

2.4.1 Outline Programme

The anticipated programme for the construction is summarised below:

Activity / milestone	Date
Earliest start date	10th August 2015
Access track construction	August - September 2015
Primary intake construction	May – June 2016

Secondary intake construction	October 2015
Primary HPPE pipeline laying	March- April 2016
Secondary HPPE pipeline laying	October 2015
Establish powerhouse working area	September 2015
Powerhouse and outfall construction	October 2015 – March 2016
Ductile iron pipe laying	April - May

2.4.2 Time Constraints

The main time constraints that apply to the programme are:

Constraint	Work affected	Dates
In-river working restriction	Construction of intake	No in-river working between November and April
Grid connection availability	Commissioning of scheme	May 2016

2.4.3 Key dates

There are a number of key stages of the works that other works depend upon. These are defined as key dates, the dates are specified in the Contract Data, the detail of what is meant by each condition is summarised below.

Condition	Description
Ready for grid energisation	Grid cable laid and backfilled Transformer plinth complete and cured Cable route into powerhouse open Powerhouse construction largely complete (i.e. walls and roof complete)
Pipeline commissioned	Pipeline cleaned and pressure tested
Powerhouse ready for turbine delivery	Powerhouse watertight and secure

2.4.4 Intervention Points

The key intervention points for ECoW and landscape advice are noted below. The ECoW will conduct regular documented inspections and audits of the site in accordance with the approved Ecological Scope of Works.

Activity	Notes
Pre-construction marking out of sensitive habitat sites	Complete
Pre-construction track and penstock micro-siting	Complete
Pre-construction checks and walk-over (if required)	Complete
Pre-construction ecological toolbox talks and briefings for all contractors	
Compound layout	

Initial track construction (peat and turve management)	
Track construction near GWDTE	
Preparation for in-stream works	
In-stream construction works	
Track re-instatement	
Works areas re-instatement	
Powerhouse landscaping	

3 MANAGEMENT REQUIREMENTS

3.1 Site Management

Under the CDM regulations the Principal Contractor is responsible for health and safety on site. This includes the health and safety of visitors, subcontractors, other contractors and members of the public who may enter the site. Therefore the Principal Contractor is to ensure that there is sufficient information available to those present on site and that those working on site have assessed, and are competent to assess, the risks that are present in the work that they are engaged in.

Glen Hydro will inform the Principal Contractor and all sub-contractors that are to be appointed directly.

3.2 Working with Contractors

The Principal Contractor is to co-operate with other contractors that are working on site and in particular is expected to:

- Make welfare facilities available to other contractors and consultants working on site
- Assist with the storage and offloading of tools and materials for other contractors working on site
- Assist with the provision of temporary power supplies for contractors working in the powerhouse

3.3 Communication and Liaison

Glen Hydro strongly believe that good communication is fundamental to the success of the project therefore all parties involved in the project are expected to communicate proactively and constructively throughout the project. Where a problem, or the risk of a problem, is identified it is to be communicated at the earliest opportunity.

There are a number of key relationships for which it is particularly important that there is proactive and effective communication:

- Between Principal Contractor and Glen Hydro (as client and project manager)
- Between the ECoW and the Planning Authority
- Between Principal Contractor and Hydropol (as designer)
- Between Principal Contractor and Auchlyne Estate (and their tenant farmer as principal user of the site)
- Between Principal Contractor and Ecological Clerk of Works

These relationships will rely on regular informal communication between parties. There will also be the opportunity to formally raise issues via project meetings. The formal meeting plan is summarised below.

Forum/scope	Parties involved	Frequency
Construction progress and plans	• Glen Hydro • Hydropol • Principal Contractor • M&E Contractor (during appropriate phase of works) • Electrical Contractor (during appropriate phase of works) • CDM Coordinator (if appointed) • Ecological Clerk of Works (as required by ECoW)	Monthly during construction
Progress and plans affecting the Estate ad farmer	• Glen Hydro • Principal Contractor • Auchlyne Estate • Tenant farmer where required	Monthly during appropriate periods of construction

3.4 Record Keeping

The Principal Contractor is expected to keep formal records on site that should be available for inspection by Glen Hydro, the Ecological Clerk of Works, the CDM Coordinator, SEPA and the Planning Authority as appropriate.

These records include, as a minimum:

- Site diary, to include:
  - Any comments from ECoW, SEPA, CDM Co-ordinator as appropriate and measures taken
  - Weather conditions
  - Work conducted
  - Personnel on site
  - Any accidents, injuries or near misses
  - Condition of plant and equipment
  - Quantity of rock encountered in the pipeline trench
- Sediment management inspection records, to include:
  - Record of inspection of individually identified sediment management features
  - Any issues identified
  - Any remedial works/maintenance conducted
- River diversion inspection records, to include:
  - Record of inspection of all coffer dams and diversions
  - Any issues identified
  - Any remedial works/maintenance conducted
- Health and safety documentation, to include:
  - Activity specific risk assessments and method statements
  - Material Safety Data Sheets and COSHH assessments
  - Inspection records and test certificates for all lifting equipment including plant, chains, strops and slings

- Records of competency for plant operatives
- Traffic Movement Records, to show: Reg. no. of vehide arriving/leaving site, type and purpose

3.5 Reporting and Monitoring Plan

The following formal reports are to be prepared during the works:

Scope	Prepared by	Frequency
Monitoring Report for Planning Authority to include update on construction, photographs, ECoW update and landscape mitigation measures and access management issues. Link to key intervention points in Programme of Works.	Project manager with input from ECoW, or direct by ECoW, as required by Planning Authority	Monthly during first 6 months, every two months thereafter
Incident report to SEPA (if required)	Project manager with input from Principal Contractor	Within 14 days of the request by SEPA

4 PUBLIC ACCESS CONSTRAINTS

4.1 General

Access to the site is from an existing track directly from the A85 trunk road. This vehicular track is wide and suitable for large vehide loads into and through the farmyard to the main construction compound. It is used by the landowner and framing tenants. All users will be made aware of the construction operations and key delivery periods prior to and during the works.

4.2 Pubic Access

There is a core path running up the glen from the A85 trunk road and the old railway is also used as a footpath. An Access Management Plan is at Appendix 2.

5 ENVIRONMENTAL CONSTRAINTS

5.1 General environmental hazards

General environmental hazards and mitigations are detailed in this document. The Glen Hydro Standard, Hydro Scheme Construction Standards and Guidance sets out the minimum standards that are expected to be maintained throughout the works, in line with accepted good practice.

Key to the implementation of these mitigations is the involvement of the ECoW, who shall visit the site a minimum of once a month during civil construction work and shall report monthly to the Planning Authority.

The Scope of Works for the ECoW is a separate document that has been approved by the LL&TNPA. A key task within this is the delivery of 'Ecological Toolbox Talks' to contractors and project personnel on site. Details of the Toolbox talks are contained at Appendix 5.

Specific environmental mitigation measures are detailed below.

5.2 Environmental Mitigation Measures

The following table outlines mitigation measures to safeguard against significant environmental effects. It is based on the analysis from the Ecology Assessments in the Environmental Statement.

Environmental hazard or constraint	Location	Mitigation
Pollution of water environment		Mitigation and control measures to prevent pollution of the water environment are covered at Section 5.3 for GWTDE and Section 8 for wider surface water management.
Vegetation	Standard	Follow good construction site management to minimise litter, dust, noise and vibration. Management of excavated soil will focus on preventing silt runoff into the water environment during rainfall periods through careful design and maintenance of drainage/silt traps. Best practice techniques (correct storage of materials, oils, diesel and sediment traps) will be employed to minimise risk or pollution and sedimentation of Ledcharrie Burn
	Intake and outfall locations	Avoid disturbance to the steep rocky bank on the Ledcharrie Burn and avoid soil erosion and slippage of sediment into the burn.
	Pipeline	Disturbance to be limited to as narrow a zone as possible (see Site Layout Map at Appendix 1). Soil erosion and sediment slippage should be avoided where the pipeline route crosses small tributaries.
Bryophytes		Disturbance and erosion to be kept to a minimum during construction of the intake and outfall, to minimise slippage of sediment into the watercourse.
Protected Fauna (specifically bats and otters) Bats: 25 trees are due to be felled at the old railway line crossing - these were inspected for suitable bat features during the initial surveys, and found to be unsuitable for bat roosts Otters: An otter re-survey was completed in	Bats: Old railway line Otters: River and construction corridor	Mitigation measures are outlined below. Ecological toolbox talks will be carried out by the ECoW. The content of these is outlined in Appendix 5. 1. All contractors should be made aware of protected notable mammals and their legal protection(species posters will be on display in the site office); 2. All personnel are made aware that protected mammals may exist close to the site and are at risk from vehicles; 3. On site, vehicular movements should be kept to a reasonable speed to ensure the species are at lowest risk to collision, injury or mortality 4. All trenches dug during construction and exposed open pipes will be covered at the end of each working day to ensure no risk to protected mammals, or any other wildlife that may have the potential to be trapped;

Environmental hazard or constraint	Location	Mitigation
June 2015. No otter holts were found.		5. Any trenches dug during excavations shall include a face of slope shallow enough to allow otters or any other mammal to exit the excavation face/s; 6. Use of ramps (wooden or metal) where shallow face trenches are not practical are advised. 7. Should evidence of regular and frequent protected mammal presence including signs, sightings or structures be confirmed during the period of excavations and within 30m of the working corridor, a follow up check by an experienced ecologist to ensure no species is adversely impacted is recommended. 8. Construction materials will not be stored on river banks where there is a risk they could impede otter movement 9. All works should be carried out according to current best practice, as described in relevant SEPA good practice and pollution prevention documents For bat species: a precautionary approach implementing standard best practice mitigation measures are to be undertaken to ensure likelihood of impacts upon this receptor result in non-significant residual effects. During construction phase, to ensure minimising disturbance or displacement of bats at present or future roosts and also commuting or foraging bats, the following mitigation is to be implemented: 1. Contactors before works should be made aware of the potential of bats, their legal protection and potential to inhabit new or unknown roosts or shelters; 2. Should evidence of bat presence including signs and sightings of bats emerging or entering trees or structures be confirmed during the period of excavations and within 30m of the working corridor, a follow up check by an experienced ecologist is advised to confirm no bat species is adversely impacted and to ensure no legal offence is committed. 3. The appointed on site supervisor of the CMS should monitor and maintain mitigation to ensure no protected bats species are significantly adversely effected during the construction period. 4. No work should be carried out after dusk and before dawn, 5. All lights should be turned off overnight as this could disturb commuting lines
Reptiles		Ensure any onsite construction materials are stored safely

Environmental hazard or constraint	Location	Mitigation
		eg fuels to avoid pollution and reptile injury/mortality. Ensure any onsite construction materials such as pipes/stonework/trenches are sealed/covered to minimize risk of reptiles becoming trapped resulting in injury/mortality
Disturbance of ground nesting birds	Track and Pipeline route	Construction works to be timed to avoid the key nesting period between mid-March and end July where possible. Work in the moorland areas (above the railway line) will therefore be limited to outwith this period. The Ecological Clerk of Works will conduct a breeding bird survey immediately prior to the laying of the penstock. Exclusion areas will be required if any active bird nests are found. The ECoW will agree the extent of exclusion areas. If confirmed nest sites are located on or near the project working areas, appropriate mitigation can devised to minimise any significant impacts on this receptor including: 1. Marking off nest sites with clear tape, rods and signs; 2. All contractors be made aware of wild nesting birds and their legal protection; 3. All personnel are made aware that wild birds may exist close to the site and are at risk from vehicles; 4. On site, vehicular movements should be kept to a reasonable speed to ensure the species are at lowest risk to collision, injury or mortality.
Black Grouse		**Black Grouse Leks have been recorded in the past between 1.60km and 2.50km west of the construction site. No Black Grouse Leks have been found within 1.50km of the construction site.** To mitigate against the potential significant effect of disturbing unknown and known leks, timing construction works to avoid the key lekking period between late March to mid-May is recommended. Where any ground preparation works are scheduled in the lekking period of late March to mid-May, a lek search survey will be carried out to ensure any new leks that establish within 1500m of the construction site are not disturbed. Where any new leks are established within 1500m, timing works to commence after mid May Is recommended or works phased to ensure disturbance to a lek or leks is avoided.
Breeding Raptors		No schedule 1/Annex 1 raptors are known to be nesting within 2.0km of the construction site. There are no active Golden Eagle territories within 6.0km of the site. If any work is undertaken within the raptor breeding season (March - July) further surveys will be carried out to ensure mitigation and work phased to avoid significant disturbance or displacement of any nesting birds. GH

Environmental hazard or constraint	Location	Mitigation
		are currently awaiting confirmation of this from the Scottish Raptor Group.

5.3 Groundwater Dependent Terrestrial Ecosystems

The NVC Habitat map and GWDTE Habitat information can be found in Appendix 3.

The habitats which are going to be disturbed during the construction period have been highlighted on the habitat map: These habitats are predominately NVC mosaics, the habitats within these mosaics all have a different dependency on groundwater - this is scored by 1 -3 (1 being high and 3 being low). As indicated on the Habitat table in Appendix 3 the majority of the habitats have a medium to low dependency to groundwater. The flushes and springs mentioned below which have a high dependency make up a small percentage of the overall ground. Unfortunately in the lower section these flushes run perpendicular to the construction corridor therefore there is no way of avoiding them. The Flush Management Plan in Section 5.3.1 will ensure that the flushes are disturbed as little as possible and the flow of groundwater is maintained. Habitat 6 on the NVC Habitat map will be marked off as a no go area and all work has been microsited to avoid the area due to the high percentage of high priority GWDTEs.

All natural and semi-natural habitats were surveyed using NVC methodology which includes all wetland habitats specified in LUPS GU4 and the SNIFFER report 2009. The GWDTE habitats of higher priority identified are:

M6: Carex echinata-Sphagnum fallax/denticulatum mire
M10: *Carex dioica-Pinguicula vulgaris* mire
M11: *Carex viridula* ssp. *oedocarpa-Saxifraga aizoides* mire
M32: *Philonotis fontana-Saxifraga stellaris* spring
M37: *Palustriella commutata-Festuca rubra* spring

Impacts to GWDTEs:

The main potential impacts of the proposed developments will be as follows:

- Disturbance and destruction of habitat during the construction phase.
- Permanent loss of habitat at the intake, powerhouse and tracks, as well as possible changes from the works such as changes to hydrology and vegetation structure.
- Temporary disturbance of habitat by vehicle tracks including potential compression of soil.
- Pollution of habitats and water-courses during the construction phase, including silt across peaty ground, which could affect plants throughout the run-off zone.
- Linear features such as tracks and pipelines and other disruption of the surface will act as a guide to water flow increasing the speed and, possibly, changing the direction of surface and ground water movement.

5.3.1 Flush Management Plan:

During construction:

- Flushes/springs need to be provided with a buffer zone of 10m marked on the ground and as far as possible this habitat should be avoided by micrositing the route above the area.
- Where this is not possible, siting should aim to avoid the main areas of biodiversity and turves should be saved separately.
- The ECoW should be consulted for any work within the 10m buffer.

- Wherever possible vehicles will be routed to avoid flushes, streams and soakaways
- Bridges will be used in preference to culverts wherever practical, over all flushes, streams and soakways.
- Any culverts used will be made of a neutral pH material such as clay or plastic, and large enough to carry heavy flow. Alongside tracks all burns and soaks will be culverted to avoid erosion of track-sides leading to erosion and siltation and to ensure the maintain the direction of groundwater
- Care will be taken to avoid disturbing the soil around the streams enabling the ground water to seep naturally through the ground.
- All staff will be advised as to where important habitats are and provided with alternative routes to avoid crossing them. Flushes will be marked on the ground with coloured tape and flags.

Across any wetland, in order to minimise any increased drainage created by linear features (pipeline, drains) the following steps will be implemented:

- Drains will be avoided as far as possible but, where necessary, will be dug around the contour rather than downslope.
- To prevent the pipeline from channelling the water along it, the peat/soil within the trench will be returned to as near natural structure as possible. As much material will be returned to the trench as possible and tamped down very firmly to evict air and close any gaps caused by cutting.
- Cuttings alongside deep peat areas will be closely bunded using sheets of plastic or clay to retain the water and prevent local drainage at the bog margins.
- Stops or bunds will be inserted along the pipe through steeper sections to deflect channelled flow.
- Vegetation turves will be cut in an irregular pattern to prevent surface lines which may channel flow.
- There will be no need for floating tracks as the peat found on the majority if the site is less than 0.50 metres.

All flush vegetation will be fully reinstated following construction:

- Reinstatement should aim to recreate the habitat, its hydrology and geomorphology.
- Substrate and turves will be stored separately for each habitat, particularly for flush habitat.
- Topsoil and sub-soil will also be stored separately.
- Substrate will be returned to any excavated ground such that sub-soil is not mixed with top-soil or peat and that an adequate layer of topsoil or peat is provided for the replaced turf species to root.
- Turves of the correct habitat should be replaced as soon as possible after removal, preferably within 48 hours and with a target of 14 days under normal conditions. Turves must be carefully replaced, vegetation side uppermost.
- The geomorphology of some features, particularly flush and soak-way habitats, must be correctly re-established to ensure that the original hydrology is maintained.

5.4 Peat and Turve Management Plan and Habitat Restoration Targets

A peat depth survey was undertaken on site in July 2015 (Appendix 4), this highlighted that the site had an overall low depth of peat bar a couple of small deep areas - the penstock route has been microsited to avoid these areas. A full peat management plan is not required for this site but a turve management plan and mitigation measures are as follows:

During construction, impacts due to vehicular access across unprotected ground should be minimised by:

- The use of tracked excavators and vehicles, which spread their load much better than wheeled vehicles.
- Care will be taken to avoid disturbing the soil around the streams enabling the ground water to seep naturally through the peat.
- The number of journeys made across unprotected ground will be minimised.

Chemical damage to the vegetation by pollution will be avoided by the following measures:

- All vehicles used will be adequately maintained.
- Wherever possible, the use of polluting substances, toxins or substances which may change the base status of the ground water will be avoided.
- Construction workers will be advised of the importance of preventing spills, in particular of any substance which may enter the water table or change the base status of the groundwater such as sediments, oil, solvents or alkaline solutions (see SEPA Guidelines).
- Sediment traps and settlement ponds will be installed wherever there is the potential for silt movement, preferably installed in slower moving drains and soaks before silt laden water can enter faster flows. Piles of gravel may be used in steeper sections to reduce flow speed and allow silt to settle. Traps must be regularly checked and maintained.

To avoid contamination of peat by mineral soil or imported material during excavation on peatland:

- All mineral soil dug out from the trench will be returned to the bottom and the excavated peat returned to the top to form the thickest possible layer of uncontaminated peat.
- Silt traps must be used wherever there is a chance of water carrying sediment flushing over the peat. Peat habitats are not grassland and should not be used to dump sediment laden water.

All vegetation will be fully reinstated following construction:

- Substrate and turves will be stored separately for each habitat, particularly for flush, peat and woodland habitat.
- Topsoil and sub-soil will also be stored separately.
- Turves will be stacked in layers no more than two turves deep and monitored to ensure they are not drying out. Dry turves should be watered as required to ensure they remain viable.
- Substrate will be returned to any excavated ground such that sub-soil is not mixed with top-soil or peat and that an adequate layer of topsoil or peat is provided for the replaced turf species to root.
- Turves of the correct habitat should be replaced as soon as possible after removal, preferably within 48 hours and with a target of 14 days under normal conditions. Turves must be carefully replaced, vegetation side uppermost.
- The geomorphology of some features, particularly flush and soak-way habitats, must be correctly re-established to ensure that the original hydrology is maintained.
- Along the length of track to be reinstated, turves will be exposed for much longer and these should be laid out no more than 1 turf thick, the right way up, and kept moist throughout their exposure.

5.5 New Zealand Willow Herb Control Plan

Aim:

- Prevent further spread of species

Method:

- Check ground work areas such as powerhouse location and intake site prior to work commencing
- Ensure stone/gravel is not moved from areas where New Zealand Willow Herb is found/or where there is suitable habitat such as stony flush habitats
- Highlight any areas where there may be an issue
- Speak to the contractors prior to work commencing to ensure they are aware of the issue and adhere to the above procedures.

6 CULTURAL HERITAGE CONSTRAINTS

6.1 Archaeology

An Archaeological Written Scheme of Investigation (WSI) and Watching Brief for the scheme has been prepared by Alder Archaeology Ltd and approved by LL&TNPA. The Project Manager will maintain close liaison with the archaeology team, providing timely notice prior to construction activities and ensuring mitigation measures are implemented in accordance with the WSI.

7 POLLUTION CONTROL

7.1 Fuel/Oil Storage and Refuelling

There will be a refuelling bowser/bunded tank located in the main compound area. This is over 40m from the burn. Refuelling will also take place on the hill access track while this track is being upgraded, at locations that >30m from the burn. The following measures shall be taken to mitigate against pollution incidents on the site:

- All construction plant and equipment will be regularly inspected and maintained to statutory and manufacturers` specifications. Any plant and machinery that will be operated within 10m of a watercourse will be checked for fuel and lubricant leaks prior to operating each day, and regularly throughout a working day. Any leaks shall be immediately fixed. Only competent and trained persons shall operate plant.
- The on-site storage of materials and equipment should be kept to a minimum. Any health and safety restrictions attached to such storage must be established and recorded. The public and natural environment must be protected from any risk associated with such storage. All hazardous materials must be identified and evaluated by mans of a COSHH assessment prior to being permitted on site. Risk assessments will be carried out for all high-risk activities and for dealing with materials covered by COSHH regulations.
- Plant and machinery must only be refuelled on hard standing / prefabricated "drip" trays at recognised refuelling points that are located more than 10m from any watercourse. Spill kits must always be present when refuelling.

7.2 Vehicle Movements and Concrete and Vehicle Washing

- No mobile concrete mixers shall cross a watercourse unless they are empty. Concrete mixers will be washed out on site in a designated washout pit located at least 30m from any watercourse. The location of these pits are shown on the Silt Mitigation map, see Appendix 6.
- A concrete washout pit shall be established in the compound areas close to the construction site (intakes, powerhouse or outfall) (>30m from the watercourse), using a natural hollow in the ground, or using straw bales. The pit shall be lined with an impermeable membrane. It is hoped that the wash pit will dry naturally. If it does require pumping out, then this shall be done to a large silt trap pit, located nearby to the pit. This will only be done with the agreement of the ECoW. Dry concrete waste shall be removed from site.
- In the event of adverse weather, i.e. period of heavy rainfall, the Site Manager will determine which if any active operations shall be permitted to continue, with reference to the ECoW as necessary.
- No river-related construction activities at the intakes, burn crossings and outfall will attempted if high flows are present or imminent.

8 CONSTRUCTION PROCEDURES and SURFACE WATER MANAGEMENT PLAN

8.1 General

As a general principle construction procedures will follow industry good practice, Glen Hydro Scheme Construction Standards and Guidance (D000-001), the Scottish Renewables joint Guide to Hydropower Construction Best Practice and the LL&TNPA Renewable Energy Supplementary Planning Guidance (2013).

8.2 Plant

Plant requirements will be confirmed once a main contractor is appointed but are likely to include:

- Tractor and trailer
- Generator
- Water pumps (with screened intakes)
- Portable concrete mixer
- Tracked excavators
- Rock breakers
- Concrete vibrator
- Miscellaneous power tools
- Office, storage and mess huts/containers and portaloos
- Temporary fencing

8.3 Compound and Laydown Areas

The main compound and main laydown area adjoins the farmyard and is already used for temporary equipment storage. The surface will be levelled and, if required once graded, topped with 100mm of type 1 material to proved a level firm base and prevent mud forming. If required, existing drains will be cleared or enhanced to ensure adequate drainage at the south end of the farmyard.

There will be a cross-drain immediately above the tarmac section, also leading to a suitable silt trap. Silt pits will be installed along the length of the site access track at a spacing of 50m, as shown on the Silt Mitigation Map.

8.4 Access Tracks

The access track shall be 3m wide. Figure 4.1, section 4.1.2 of the CIRIA manual recommends that the first 12-15mm of rainfall be collected and treated therefore silt traps will be placed at intervals of 50m and pits should be sized at 50m x 3m x 0.015m = 2.25m^3.

The location of silt drains and access tracks is marked on the Silt Mitigation Map at Appendix 6.

8.5 Intake Structures (Main and Secondary)

Under the CAR regulations this shall only be carried out during the in-river working season (May 1st to October 31st for this scheme).

The work involved in the construction of the intake is as follows:

- Create river diversion

- Create coffer dam using builders bags filled with suitable material, seated upon and overlapped by heavy tarpaulin or DPM
- Every effort will be made to keep the area dry. Pumps shall be used only as a last resort and shall be approved by the ECoW.
- Establish pumps and other sediment management to keep working area dry and avoid contamination of the burn
- Excavate and pour blinding concrete
- Construct weir structure and wing walls
- Construct settling tank
- Install intake fabricated structure, fixtures and fittings
- Construct connecting, twin-wall pipe between structures
- Construct scour protection
- Remove coffer dam and diversion
- Complete wing walls and scour protection
- Landscaping

Prior to setting up for the construction work for the river diversion, a drain shall be constructed alongside the burn between the works and the water. This drain shall lead to a suitably sized silt trap (at least $2m^3$).

The river diversion shall then be put into place. For the secondary intake this is likely to be done using lengths of large diameter flexible hose pipe. The river diversion shall be sized to accommodate a flow equivalent to Q5 (171l/s at the secondary intake).

For the main intake it is envisaged that a coffer dam will be constructed in the river to allow the construction of one half of the intake structure footing. The water will then be diverted to flow over this structure whilst the second half of the intake is constructed behind a further coffer dam. The diversion flow will be expected to be around Q5, which is 1.049 cumecs at the main intake site. Coffer dams shall them be constructed above and below the works to ensure that the working area of the intake is kept dry. Coffer dams and diversions are to be sized to accommodate a flow of Q5The coffer dams shall be 2m high and will therefore be more than adequately sized. The dams shall consist of:

- Heavy duty Polyethylene to form impermeable layer
- 1 ton Sand bags filled with course sand
- Small sandbags to fill in voids between larger sandbags

Coffer dams shall be inspected daily to confirm that integrity of coffer dams is satisfactory and that diversions remain appropriately sized to accommodate Q5 flow. A record of inspection of coffer dams to be available in the site office.

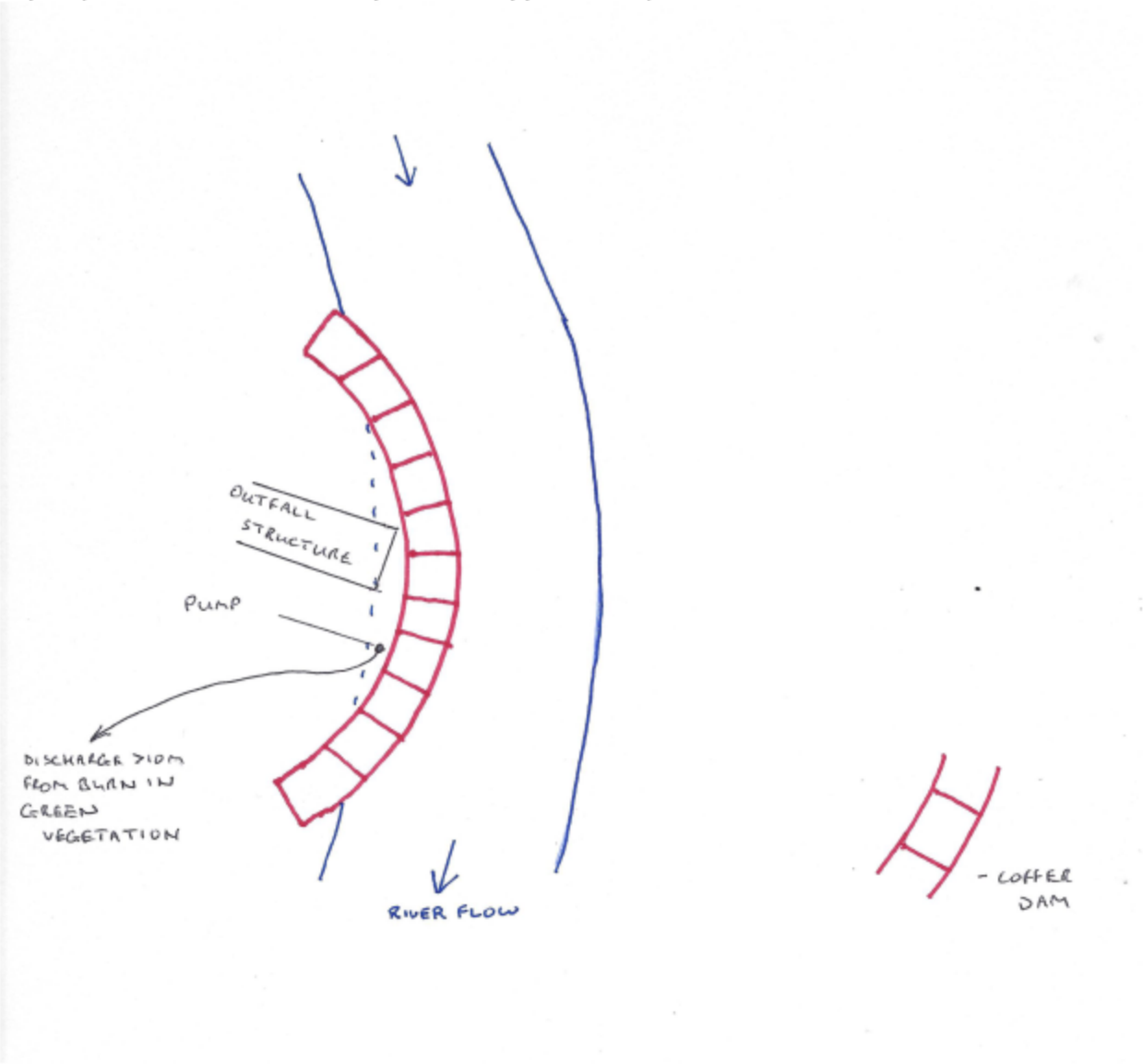
During the concrete pours for the intake structure, a concrete washout pit shall be established adjacent to the intake site, using a natural hollow in the ground, or using hay bales. The pit shall be lined with an impermeable membrane. Dried concrete waste shall be removed from site.

The location of silt drains and access tracks is marked on the Silt Mitigation Map at Appendix 6.

8.6 Outfall Structure

Under the CAR regulations this work shall only be carried out during the in-river working season (May 1st to October 31st).

A coffer dam shall be constructed around the works to ensure that the working area of the outfall is kept dry. The coffer dam shall be positioned approximately as shown:



Coffer dams and diversions are to be sized to accommodate a flow of Q5, equivalent to 1.22 cumecs at the outfall site. The coffer dams shall be 1m high and will therefore be more than adequately sized. The dams shall consist of:

- Heavy duty Polyethylene to form impermeable layer
- 1 ton Sand bags filled with course sand
- Small sandbags to fill in voids between larger sandbags

Coffer dams shall be inspected daily to confirm that integrity of coffer dams is satisfactory and that diversions remain appropriately sized to accommodate Q5 flow. A record of the inspection of coffer dams to be available in the site office.

During the concrete pours for the outfall structure, the concrete washout pit established nearby shall be used as previously described.

Water should only be pumped from the working area as a last resort. It will be pumped to a location to the east, a significant distance from the burn and this shall not be done prior to this location (or pit) is agreed with the ECoW.

8.7 Powerhouse

The work involved in the construction of the powerhouse is as follows:

- Excavate and pour blinding concrete for powerhouse substructure
- Construct powerhouse substructure including substation plinth
- Lay first section of pipe towards tailrace
- Lay drainage
- Construct pigging chamber

Prior to setting up for the construction work, a drain shall be constructed alongside the burn between the works and the water. This drain shall lead to a suitably sized silt trap (at least $2m^3$). A similar drain and silt trap shall be installed immediately to the northth of the powerhouse working area.

The exact location of silt drains and access tracks is shown on the Silt Mitigation Plan at Appendix 6.

During the concrete pours for the powerhouse, the concrete washout pit nearby shall be used as previously described.

8.8 Penstock Pipe

The upper portions of the penstock pipes will be of welded HDPE construction, the lower, high pressure part of the pipeline shall be of ductile iron construction. The HDPE pipeline shall be laid from the intakes downwards. The ductile iron pipeline shall be laid from the turbine house upwards. The penstock is of a relatively small diameter (around 200mm form the secondary intake to 560mm in the main pipe) and there is not expected to be much rock present in the penstock trench. For these reasons the laying operation should not be a long and protracted affair. The penstock is a good distance from the burn (>100m in all places with the exception of the top and bottom 150m).

The following precautions shall be taken while laying the penstock pipe to ensure that the water environment is not polluted:

- A maximum of 300m of trench shall be excavated at any one time. This is to prevent the pipeline trench becoming a drainage ditch for the hillside and thereby causing a silt contamination risk.
- The penstock trench will include impermeable barriers and / or clay plugs to avoid the trench acting as a water conduit where the penstock passes through any wet areas or on steeper slopes. These barriers shall be placed at intervals of 100m on steep ground and at a maximum of 200m. This is specified on the Penstock detailed drawings.
- Where rock is encountered this will be broken using a mechanical rock breaker. Screened material from the excavation of borrow pit (if required) will be used to bed and blind the pipe.
- It is not anticipated that the penstock will cross any watercourses. In the event that a watercourse must be crossed (eg in wet weather), the procedure below shall be followed:

Removed turves shall be stored, turf side downwards and the re-instatement of the pipe track shall be completed in line with the procedure set out in section 5.4.

8.9 Landscape Mitigation and Reinstatement

The landscape mitigation measures noted below are based on those set out and agreed in the Landscape and Visual Impact Assessment Volume 2: Appendices.

Activity	Landscape and visual effects to be addressed	Mitigation
Construction activity: 40 week construction period with machinery and movement, restricted to working corridor	More human activity in mountain landscape, although restricted to a narrow corridor.	More human activity in mountain landscape, although restricted to a narrow corridor.
Penstock route: linear excavation earthworks	Creation of a linear feature during construction	Rolling programme of restoration as penstock is laid and buried so that whole line of excavation is not visible at same time.
Temporary track to secondary intake	Creation of a linear feature during construction.	The same measures as proposed for earthworks and for the penstock to be applied to the temporary track, in order to ensure the route of the temporary tracks blends back into the landscape after construction.
Laydown area: Stone surfacing, piles of materials.	Main laydown is alongside farmstead where manmade features are already dominant.	No mitigation apart from normal construction management.
Earthworks and excavations	Potential mixing of soil layers, potentially causing a change to the soil condition which would lead to potential subtle changes in vegetation patterns.	Vegetation layers (turf etc), topsoil and subsoil arisings to be lifted and stored separately from each other, and following construction work to be carefully repositioned in original location and order, ensuring subsoil and topsoil layers are not unnecessarily mixed. To ensure that the returned vegetation does not change due to there being different water, drainage, pH or organic soil conditions.
Primary and Secondary intake structures: while the two structures are different sizes they would have largely the same appearance and their settings would be similar.	Introduction of manmade feature where there are few close-by (albeit in a place where visibility is very restricted)	Use site-won boulders and earth modelling around sides of weir to give the structure a naturalistic setting. Place any moved boulders in their original orientation so that weathered surfaces, lichens etc. remain exposed. Restore retained vegetation around structure.
Penstock: excavated boulders cast to the side	Potential to leave a linear pattern going up the hillside	Contractors to scatter excavated boulders in random pattern, or re-bury

Activity	Landscape and visual effects to be addressed	Mitigation
of the penstock route, backfilling of penstock and lifting of vegetation	Potential to leave flat or engineered micro-landforms, thus reducing the natural appearance. Potential to cause a stripe of different vegetation	them Landform to be restored to match existing shapes in the immediately adjacent land. Retain existing turfs and use them to re-cover over penstock
Permanent Track: Upgraded existing track at northern end of site. New track at southern end of site, on top of penstock. Both using site-won crushed aggregate.	Increase in linear features in landscape, reducing the 'natural' appearance of the landscape (albeit in an area which already has a track and other man-made structures)	Use existing tracks where possible. Micro-site the track to work with existing topography (eg going ground, and not through small landforms); this will give the track a less 'straight' appearance, and it will benefit from naturally occurring screening. Allow track to vary in width; avoid overly parallel sides. Use site won boulders to create screening and to create micro-habitats for colonisation by native plants. Contractors to scatter excavated boulders in random pattern, or re-bury them. Where bedrock is close to the surface the track would be constructed directly onto the substrate. In all cases keep track as narrow as possible and at end of construction the verges softened and lined with peat turves stored from soil strip. Thin layer of soil to be placed on top of the track to promote re-colonisation by local vegetation. Re-colonisation by vegetation to be encouraged and not thwarted by uneccessary management or vegetation control.
Powerhouse and ancillary equipment: final finish and materials to follow once powerhouse design completed	Introduction of new building in landscape increases the human influence on the landscape although this close to an extensive existing farmstead, pylons and a transport corridor.	Roof is coloured to match nearby agricultural buildings. Use concrete render for the walls, to have same appearance as farmhouse; allow lichens and algaes to naturally settle on surfaces. Use the same colour and matt texture as the roof for doors, fences and louvres to reduce the variety and complexity of the building.

Activity	Landscape and visual effects to be addressed	Mitigation
		Fences and walls painted in same colour as louvres etc. Plant mix of new trees (Scots Pine, larch, silver birch, rowan and oak) to screen views of the powerhouse. Extend this line of deciduous trees so that they go the burn edge and along the edge of existing birch trees. Note: this measure offers an opportunity for ***enhancement*** of the local area by softening the appearance of damaged, mono-culture coniferous plantations. To be confirmed once final powerhouse design is agreed.
Outfall	Negligible increase in manmade features (in setting of nearby large farmstead)	Use techniques similar those for intake to help fit the structure into its setting.

9 WASTE

Suitably marked and secured containers will be situated on site for the storage of waste. These materials must be transported by the Contractor on a regular basis to a covered skip in the Compound. The Contractor is responsible for making arrangements for the proper servicing of port-a-loos. It is not anticipated that any hazardous materials will enter the site but SEPA will be consulted should this situation change. Waste will not be burned or buried on site. In accordance with SEPA PPG6 Section 7, the Principal Contractor will be responsible for:

- Identifying waste on the site which will require to be registered with SEPA as an exempt activity.
- Waste must be stored in such a manner as to prevent its escape or scavenging by vandals, thieves, trespassers or children.
- Waste may only be carried by a person either registered with SEPA as a carrier of controlled waste or who is exempt from holding such registration.
- Transfer Notes must be kept for two years and available to SEPA officers on request.
- The Contractor must identify wastes hazardous to human health or the environment. In these cases a "Consignment Note" (which can be purchased from SEPA) must accompany the movement of waste.
- Waste may only be disposed of at a licensed Waste Management facility such as a landfill site, or at a site which has registered its activity with SEPA as being "exempt". In both cases, strict controls operate which regulate the type and quantity of waste which may be accepted at the site by the operation.
- The transporter must check that the site to which waste is to be taken has the relevant licence or exemption. This may be checked with the local SEPA office.

10 EMERGENCY ARRANGEMENTS

This CMS provides guidance to the Principal Contractor on how the project should be carried out to protect environmental interests. The following documents shall be prominently displayed at the Site office:

Emergency Contact Sheet, including pollution clean-up specialists. Emergency contacts are given in section 2.2.3.
Oil Spill Emergency procedure – See Appendix 7
Land Slip Emergency procedure – See Appendix 8

The Principal Contractor's Site Manager shall have overall responsibility for ensuring that all emergency procedures as displayed are understood by all site staff and sub-contractors and carried through as specified, and that all preparations for and reports of any incidents are fully documented and reported to the Project Manager. The Principal Contractor's Site Manager shall ensure that the planning authority and statutory consultees are satisfied regarding the arrangements which have been made, including making available current inventories of all safety-related equipment held on site and its whereabouts at any time.

11 REFERENCES

Loch Lomond & The Trossachs National Park Authority Renewable Energy Supplementary Planning Guidance (2013)