Appendix B. Construction Method Statement



Garmony Hydropower Scheme

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April 2011

Mott MacDonald

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Content

1. General Description

It is proposed to construct a small hydroelectric scheme at Garmony on the Island of Mull. The scheme will be a run-of-river type, with no storage of water, and the electricity generated will be exported to the existing distribution network.

The typical approach to constructing a run-of-river hydro generating scheme, such as the one proposed, comprises the following, but not necessarily sequential, stages:

- Construct site compounds, lay down areas and other preparatory works
- Mobilisation of plant, welfare and personnel to site
- Initial construction works – construct and/or upgrade access tracks
- Main construction works – construct intake weirs, pipeline, powerhouse and tailrace; and
- Reinstatement of land

The construction process for a scheme of this size and detail would typically run over a period of 9-12 months, although the majority of the main construction operations would be completed within 5-6 months.

The construction method statement with the descriptions for each aspect of the proposed works is presented below. There may be small amendments to the method described as the project proceeds and a better understanding of ground conditions is gained. However the final detailed design is not expected to differ from that described and any changes will not affect the findings of the ES.

2. Access

Arrangement

The existing forestry access tracks will be utilised as the principal access for the construction and operation of the scheme. Minor works may be required to upgrade the track between the public road and the site.

Construction access will follow the pipeline route between the powerhouse and intakes. During the operational phase of the scheme, the route of this access will be retained for ATV use (e.g Argocat or quad bike), to permit inspection and cleaning of intake screens.

Access construction methodology

The work sequence will be as follows: -

- Site engineer will set out line and level control for excavation works. Known areas of deep peat will be clearly marked out and avoided where possible.
- If required batter rails will be erected to form batters, drainage and ditches.
- The tracked excavator will strip the topsoil and set it aside for later reinstatement or soiling of batters as required.
- The excavator will excavate the subsoil to the correct profile.
- If required, a hydraulic breaker will be used to break any rock encountered.
- Surplus material will be removed and transported to the designated stockpile area.
- If required, geotextile will then be placed over the subsoil.
- Fill material and / or sub base will be imported as required.
- All fill material will be laid to the required depths & finished levels and will be fully compacted in layers using a ride on roller.
- Cut off ditches / road edge ditches will be formed as required.
- For permanent roads, topsoil will be spread on batters.

3. General Environmental Measures

The proposed development has been designed and planned to minimise its environmental impacts. Specific areas where the environment has been considered include:

- Site selection to avoid protected or designated environment, landscape character or cultural heritage areas;
- Scheduling of works to reduce impacts on the natural heritage;
- Use of existing access tracks where possible;
- The provision of local employment opportunities.

For all works, the following measures will be taken:

- A site walkover must be conducted prior to any commencement of works in order to check for the presence of breeding birds, protected under the 'Nature Conservation Act 2004' previously the 'Wildlife & Countryside Act 1981.' The works are not expected to result in a negative impact upon the species, though consideration should be given to the potential of late or early nesting birds. If any nests are found or suspected whilst conducting the site walkover, the contractor or engineer should contact M&ICT immediately who will deploy an ecologist to assess. The area should then be ring fenced by barrier tape and a 10m buffer zone maintained until further advice provided.
- All identified archaeological sites will be marked out and fenced off prior to commencement of works.
- An oil spill kit will be maintained on site at all times. Spill kit and fire extinguisher to be kept in all excavators.
- Any plant used on the contract will be cleaned before use and will be regularly checked for leaks, drips etc.
- Fuelling operations and washing of vehicles or plant will carried out at the designated areas at least 10m from surface or ground water.
- In the event of a spill operations will cease, and the spill will be treated in accordance with an agreed spill response procedure.
- Operatives will be briefed in the form of a toolbox talk on this Method Statement, Risk Assessment and the spill response procedures.
- Oil booms will be set up across the watercourse downstream of in-river works. Diesel will be stored in a bunded tank at the compound area - This will be padlocked at all times.
- Small plant i.e. generators and pumps to be kept in an impervious drip tray with capacity equal to or greater than 110% of the capacity of the fuel tank at all times.

All practical measures will be taken for silt and sediment control management, with particular reference to the CAR Licence, to SEPA Regulatory Method WAT-RM-02 Regulation of Engineering Activities and WAT-SG-26 Sediment Management. The relevant SEPA Pollution Prevention Guidelines (PPG's) will also be consulted, in particular PPG1 General Guide and PPG5 Works in or near water.

4. General Health and Safety

For all works

- Appropriate PPE will be worn at all times. This will typically include hard hats, eye protection, protective trousers, gloves and reflective clothing. Hearing protection, masks and wet weather clothing will be available for use where necessary.
- COSHH assessments for fuels and oils will be contained within the site file.
- First aider will be on site at all times.
- All plant will be operated by competent certified operators. Plant to be inspected regularly and have the appropriate certification.
- Manual lifting operations will be kept to minimum by the use of mechanical means.
- Certified chains and slings will be used at all times.

For in or near river works

- Prior to works in the river, a grab rope will be set up downstream of the works in case of a surge of water, operative trip etc.
- Weather and flows to be assessed prior to commencement of works and regularly during the works.
- Life buoy will be on site close to relevant work areas at all times.
- Operatives will wear waders when working in or near river.

5. Intake Structures

Arrangement

The intake structures will be of concrete construction, designed to use the minimum quantity of imported materials and minimise the visual impact as far as practicable.

They will include permanent provision for a preferential hands-off flow to pass the structure irrespective of whether abstraction is taking place or not, and will be fitted with a screen to prevent debris or animals becoming trapped or entering the pipeline.

Intakes construction methodology

The intake weir will be formed as a concrete structure built across the stream at the associated grid reference point. The water required for generation will pass through the Coanda or bar screen and be collected in an intake chamber prior to entering the pipeline.

Construction of the intake structure will be carried out during periods of low to moderate flow, typically between May and October, and will require the temporary diversion of water. The method will involve either the construction of a temporary bund across the riverbed made from sand bags and locally available materials to divert the flow through a temporary bypass channel or a large diameter pipe which will be cast through the structure.

The work sequence will be as follows:

- Diversion channel will be put in place first where a diversion channel is to be used.
- The access to the river will be excavated with the material removed by dumper and stockpiled nearby. Access to the river will be adequately shored in order to prevent mud and sediment entering the river. A separate area will be made available where plant and vehicles can be cleaned down prior to entering the river.
- The excavator will then access the river to clear boulders etc and will break out the existing rock to allow installation of the scour pipe (and optional diversion pipe). The pipes will be extended past the limits of the intake to give a suitable dry working area. Bulk bags lined with polythene if required will be positioned to divert the river down the bypass pipe. Pecking will only be performed under dry conditions and not within the river water.
- Pre fabrication of steel, shuttering etc will be carried out on the adjacent bank to limit the amount of time spent in the river channel by the operatives.
- All materials will be transported by mechanical means to the intake aided by a slinger/banksman.
- After the bypass has been set up and reviewed the steel fixer will place the reinforcement around the pipe and drill and fix the dowels, joiners will shutter the kickers then pour the base of the intake.
- Dependant on the size of the pours, an excavator will place the concrete. The bucket or skip will be filled ¾ full to reduce spillages whilst transporting the concrete. If any spillages do occur they will be removed after the pour and disposed of at the concrete wagon wash out bay.

- The kicker will then be scabbled and hydrophilic sealant will be placed at the construction joint as specified.
- The wall steel will then be erected. Wall shutters will be erected, shored and concrete poured up to the overshot screen level. Fix steel, erect shuttering and pour concrete as above.
- The intake chamber, which will be set back from the river, will have kickers shuttered then the base of the chamber will be poured. Walls, slab and wing wall construction as above.
- After the cover slab is completed this allows the metalwork sub contractor access to the structure.
- The pipe from the structure will be installed and concrete surrounded.
- To minimise the visual impact, this area will be reinstated as working away from the structure i.e. remove diversions pipes, reform river bed, reinstate the ATV access etc.

6. Pipeline Construction

Arrangement

Water will be transferred from the intakes to the powerhouse via a pressure pipeline. The pipeline will generally follow the alignment shown, but may deviate locally to allow an optimal alignment to suit topographical and ground conditions.

The following technical and environmental constraints were considered during the development of the pipeline alignment:

- Intake and powerhouse locations
- Local topography of the site
- Minimising the length of the pipeline route and number of river crossings
- Avoiding any sensitive environmental and archaeological areas wherever possible

The need for a continuous fall along the pipeline may require landscaping works to locally raise existing ground levels in order to give sufficient depth of cover to the pipe.

Once a detailed alignment has been fixed, the construction corridor will be limited to a width of approximately 30m, although this could be reduced if required at certain points to avoid environmental constraints.

Pipeline construction methodology

The work sequence will be as follows: -

- A basic site survey will be carried out and any existing services will be identified. The route and level will then be set out.
- A temporary access track will be constructed for pipe laying.
- The pipes will be offloaded directly from delivery lorries onto prepared storage areas in the working compound.
- The pipes will be lifted using the tracked excavator and tractor with trailer to the welding area, where they will be strung out.
- Lengths of welded pipe will be transported to where they should be laid in accordance with the suppliers guidance.
- The topsoil will be stripped and re-used for reinstatement.
- If a possible man-made structure is found, the archaeologist will be called to site to assess how to proceed.
- Excavation to be performed to the right level with rock being excavated as needed using hydraulic breaker.
- Bedding will be laid to the correct level at the bottom of trench.

- Pipe will then be placed in position in accordance with the pipe specification and manufacturers instructions with final connections made.
- Pipe to be backfilled as detailed in the contract drawings with selected as dug material.
- The bedding will be compacted with a wacker plate until pipe is fully bedded and surrounded as per bedding detail in the contract drawings.
- Ground surface to be reinstated with sub soil/top soil where required.
- Upon completion of all pipe laying and backfilling, the pipelines will be flushed, swabbed and tested as per the technical specification.
- Where small burns are to be crossed, the flow will be temporarily diverted (by channel, pipe or over-pumping) for a short period as the pipe trench is excavated. The pipe will be placed and backfilled as shown in the contract drawings. The burn bed and banks will be reinstated as indicated on the drawings prior to the diversion being removed.

7. Powerhouse and Tailrace Construction

Arrangement

The construction of the powerhouse will include the construction of a concrete slab capable of withstanding the thrust force from the pipeline; the blockwork superstructure including a crane beam, a pigging chamber, tailrace and the connection of the pipeline to the main inlet valve and turbine will be an integral part of this.

The powerhouse building containing the turbine, generator, and associated equipment will be located to maximise power output of the scheme and avoid any environmentally sensitive areas.

The powerhouse building will be constructed in keeping with the local environment and will be finished in the local vernacular style, either neutral coloured corrugated sheet walls and roof, or blockwork walls with a grey harled finish and a corrugated sheet roof. The powerhouse will be located to reduce the visual impact of the structure as far as practicable given other constraints, will be designed to minimise noise and vibration disturbance to nearby receptors.

A tailrace will transfer water back to the original watercourse after passing through the turbine located within the powerhouse. A fish screen will be fitted across the tailrace outfall.

The tailrace will be designed to dissipate energy, thus minimising erosion of the main riverbed and banks, as well as minimising the impact on fish.

Powerhouse and Tailrace construction methodology

The work sequence will be as follows: -

- A basic site survey to be carried out on site.
- Geotextile material to be installed to act as a filter to prevent contaminated water from entering the watercourse.
- Excavation to be carried out to formation level using 360 degrees excavator with a hydraulic hammer where necessary.
- The tailrace outfall structure will be isolated from the river during construction.
- All excavations sides to be safely stepped or battered back. Excavation to be fenced off at all times. Excavation to be monitored and inspected daily.
- Blind formation with concrete.
- Steel reinforcement to be installed for base slab and tail race, then shutters and kickers to be erected and concrete poured using a concrete skip or pump.
- The kickers/construction joints will be scabbled and water bar placed as per the specification.
- The tailrace wall steel will then be erected as the base shutters are being stripped, wall shutters placed and concrete poured. Strike formwork once the concrete has cured.

- Take structure up to foundation level ready for the blockwork and building sub-contractors.
- Methods statements from sub-contractors involved in the construction of the powerhouse will be incorporated in the health and safety plan.
- Carry out ground works including backfilling, bunds and landscaping around powerhouse as per the drawings.
- Remove anti-pollution method.
- Tidy site on conclusion and reinstate fully.