

SKYE REINFORCEMENT PROJECT

Appendix V2.6.4: Groundwater Dependent Terrestrial Ecosystem (GWDTE) Assessment

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CONTENTS

1.0	INTRODUCTION	1
1.1	Conceptual Hydrological Site Model.....	1
2.0	NVC MAPPING AND OCCURRENCE OF POTENTIAL GWDTE	2
2.1	NVC Mapping.....	2
2.2	Occurrence of Potential GWDTE.....	2
2.2.1	Habitats with Potential Moderate Groundwater Dependency.....	2
2.2.2	Habitats with Potential High Groundwater Dependency.....	3
2.2.3	Summary.....	5

DOCUMENT REFERENCES

TABLES

Table 2-1:	Moderately Dominant Habitats.....	3
Table 2-2:	Highly Dominant Habitats.....	3

1.0 Introduction

This Appendix presents an assessment of potential areas of Groundwater Dependent Terrestrial Ecosystems (GWDTE) at the Skye Reinforcement Project, hereafter referred to as the 'Proposed Development'.

A number of surveys, including a programme of peat depth probing and a National Vegetation Classification (NVC) survey have been undertaken and which have been used to inform this assessment.

This Appendix should be read in conjunction with the following Chapters in Volume 2 of the Environmental Impact Assessment (EIA) Report:

- Chapter 6: Water Environment, which contains a detailed description of the local hydrology and hydrogeology, flow mechanisms and hydraulic properties of the soils and geology;
- Chapter 7: Geology and Soils Environment, which contains details of peat depths and further details of the superficial and solid geology; and
- Chapter 4: Ecology, which contains detailed description of the NVC survey undertaken and survey methodology.

1.1 Conceptual Hydrological Site Model

The following conceptual hydrological site model has been developed, following a review of the site setting as outlined in the Chapters referenced above:

- the Proposed Development is located in an area that receives frequent rainfall and has a high annual rainfall total;
- where there are no drift deposits present, there is potential for some shallow groundwater to be present in the upper weathered surface of the bedrock. This is however generally on elevated sloping ground where rainfall would preferentially form surface runoff and thus limit the production of groundwater;
- where shallow groundwater flow does occur in the weathered bedrock deposits it will follow topography;
- any groundwater in the alluvial superficial deposits is likely to be locally perched above the regional groundwater table in the bedrock deposits and will generally be limited in extent to the alluvium which bounds larger watercourse corridors; and
- the potential for rainwater recharge to groundwater within the bedrock will be limited by the presence regionally of peat and clays associated with the glacial till deposits. Incident rainfall is likely to preferentially pond on the ground surface and where surface gradients allow form surface runoff or shallow interflow within the acrotelm (top) layer of the peat rather than infiltrate and form significant groundwater recharge.

The absence of significant quantities of groundwater in the superficial and bedrock deposits is confirmed by published mapping (see **Volume 3, Figure V2-6.2** and **Figure V2-6.3**) and **Volume 5, Appendix V2-6.3: Drinking Water Protected Area and Private Water Supply Risk Assessment** which records few groundwater abstractions.

The hydrological site surveys have confirmed that rare groundwater springs are present regionally and are used to support private water supplies.

2.0 NVC Mapping and Occurrence of Potential GWDTE

2.1 NVC Mapping

The survey methodology and findings are discussed in detail in **Volume 2, Chapter 4: Ecology** of the EIA Report. In total, 46 NVC communities, 14 intermediates, and 28 non-NVC communities were recorded within the survey area extent for the Proposed Development.

Weather conditions for the most part was amenable to survey with light to moderate winds and good visibility prevailing. Overall, weather conditions did not notably limit surveys.

Many of the surveys were undertaken in the months of October and March, with a lesser amount of survey effort taking place in the months of November and February. These months are generally considered to be outside the optimal survey period for vegetation and habitats. However, despite the time of year, the overall character and type of vegetation was still readily recognisable and could still be accurately attributed a NVC community due to the surveyor knowledge and survey area from other ecological surveys throughout the year and the persistent and still easily identifiable vegetation present in many areas.

2.2 Occurrence of Potential GWDTE

The assessment of GWDTE began with identifying the NVC communities which are cited in SEPA guidance¹. Four categories have been used to classify potential GWDTE area, as shown on **Figure V2-6.4**:

- Highly Dominant, where potential high GWDTEs dominate the polygon (over 50% of the polygon);
- Highly Sub-dominant, where potential high GWDTEs make up a sub-dominant percentage of the polygon (less than 50% of the polygon);
- Moderately Dominant, where potential moderate GWDTEs dominate the polygon (over 50% of the polygon) and no potential high GWDTEs are present; and
- Moderately Sub-dominant, where potential moderate GWDTEs make up a sub-dominant percentage of the polygon (less than 50% of the polygon) and no potential high GWDTEs are present.

Areas determined to be Highly Dominant and Moderately Dominant were then subject to further site-specific scrutiny in terms of topography and hydro-ecological context and are discussed in the sections below.

2.2.1 Habitats with Potential Moderate Groundwater Dependency

Table 2-1 details areas of potential moderate groundwater dependent habitats determined to be Moderately Dominant and discusses whether these habitats are likely to be sustained by groundwater.

As shown on **Figure V2-6.4**, generally the areas designated as Moderately Dominant cover large areas over a range of elevations and slopes. This distribution is not typical of that which is sustained by emerging groundwater, such as springs or seepage line.

¹ SEPA (2017) Land Use Planning System SEPA Guidance Note 31, Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3.

Table 2-1: Moderately Dominant Habitats

Habitat	Location	Discussion
M15	Extensive areas across the entire Proposed Development.	The habitats are typically located on ground which is underlain by low permeability glacial till deposits within the western extent of the Proposed Development. Habitat is not rare and is present across large areas of Scotland. Given this distribution and location it is considered that these habitats are sustained by the high average annual rainfall witnessed in the west of Scotland, surface water runoff and surface water ponding rather than by groundwater. Buffers specified in SEPA guidance to this habitat therefore need not apply, but safeguards will be required during construction to maintain existing surface water flow paths to this habitat during and following dismantling/construction.
M25	Extensive areas across the entire Proposed Development.	The habitats largely coincide with watercourse channels. It is therefore considered that these habitats are sustained by surface water, rainfall and waterlogging of soils rather than by groundwater. Again, buffers to this habitat specified in SEPA guidance need not apply, but safeguards will be required during construction to maintain existing surface water flow paths to this habitat during and following dismantling/construction.
MG9	Section 4	The habitats largely coincide with watercourse channels. It is therefore considered that these habitats are sustained by surface water, rainfall and waterlogging of soils rather than by groundwater. Again, buffers to this habitat specified in SEPA guidance need not apply, but safeguards will be required during construction to maintain existing surface water flow paths to this habitat during and following dismantling/construction.
MG10	Small areas across the entire Proposed Development, except for Section 6	
U6	Section 0 and 4	
W1x	Section 0, 1, 2, 3 and 5	

Note: Table lists the largest proportion of habitat recorded in a NVC polygon. Where a polygon records intermediate communities of potential moderate groundwater dependency these are not presented or discussed.

In addition to the moderately dominant habitats described in **Table 2-1** the NVC survey also noted areas of M28 which is also considered a potential moderate groundwater dependent community. The M28 was noted in areas determined to be Highly Sub-dominant, which are discussed below.

2.2.2 Habitats with Potential High Groundwater Dependency

Table 2-2 details communities determined to be potentially Highly Dominant and discusses whether they are likely to be sustained by groundwater.

As shown on **Figure V2-6.4**, generally the areas designated as Highly Dominant are localised largely coincide with watercourse channels or areas immediately adjacent to the watercourses.

Table 2-2: Highly Dominant Habitats

Habitat	Location	Discussion
M6	Small areas across the entire Proposed Development	These habitats largely coincide with watercourse channels or sloped ground adjacent to the watercourses. It is therefore

Habitat	Location	Discussion
M23	Sections 0, 1, 2, 3, 4 and 5	considered that these habitats are sustained by surface water, runoff and waterlogging of soils rather than by groundwater. Buffers specified in SEPA's guidance to this habitat therefore need not apply, but safeguards will be required during dismantling/construction to maintain existing surface water flow paths. Works in these areas should be supervised by the project Ecological Clerk of Works (ECoW).
CG10	Section 0	These habitats are typically classified as flush features that tend to be supported by a level of base-rich waters. Across the Proposed Development, these habitats are localised and situated on sloping ground which is on or adjacent to watercourse channels. Generally, these habitats are underlain by low permeability deposits and/or in areas whereby no significant change in the mapped geology is noted. The distribution is not typical of that attributable to a dominant groundwater discharge. It is considered that rainfall and surface water the dominant water source that sustain these habitats, although groundwater may also be present.
M10	Sections 0, 2 and 3	
M11	Section 4	Buffers specified in SEPA's guidance to this habitat therefore need not apply, but safeguards will be required during dismantling/construction to maintain existing surface water flow paths. Works in these areas should be supervised by the project Ecological Clerk of Works (ECoW).
W4	Small areas across the entire Proposed Development	These habitats are also localised and situated on sloping ground which is on or adjacent to watercourse channels. The habitats where not immediately adjacent to watercourses are also generally underlain by glacial till or peat deposits. The distribution is not typical of that attributable to a dominant groundwater discharge and it is considered that rainfall and surface water sustain these habitats. Rainwater and runoff will pond on the low permeability geology which will result in waterlogging of the soils.
W7	Sections 0, 3, 4 and 5	Buffers specified in SEPA's guidance to this habitat therefore need not apply, but safeguards will be required during dismantling/construction to maintain existing surface water flow paths. Works in these areas should be supervised by the project Ecological Clerk of Works (ECoW).

Note: Table lists the largest proportion of habitat recorded in a NVC polygon. Where a polygon records intermediate communities of potential high groundwater dependency these are not presented or discussed.

In addition to the highly dominant habitats described in **Table 2-2**, the following potential high groundwater dependent habitats were also noted as part of the NVC survey:

- M9;

- M14;
- M32;
- U16; and
- M29.

With the exception of M32, these habitats are located within areas determined to be Highly Sub-dominant or part of the sub-communities of those discussed in **Table 2-2**. These are likely to represent small areas within the larger communities and are generally recorded within similar conditions to those described in **Table 2-2**. It is therefore considered these communities are predominately sustained by rainfall and surface water runoff, although a contribution of groundwater locally support these communities.

As with M10 and M11, habitats which are designated as M9, M14 and M32 are typically classified as flush features that tend to be supported by a contribution of base-rich waters. Works near these communities should be supervised by the project Ecological Clerk of Works (ECoW) to ensure potential groundwater and surface water flow paths are maintained.

Two springs were noted within Section 3 near Harrapool, which corresponded with M32 flush habitats. These M32 habitats are considered to be groundwater dependent, however, these are noted upstream of the Proposed Development and therefore not considered to be at risk.

2.2.3 Summary

After review of **Figure V2-6.4**, and **Table 2-1** and **Table 2-2** above, it is evident that typically potential groundwater dependent habitats are located over large areas or in/adjacent to watercourse corridors. This distribution is not consistent with habitats sustained by groundwater but rather habitats predominantly sustained by the high average annual rainfall, surface water runoff and surface water ponding.

No permanent dewatering or groundwater management is required as part of the Proposed Development and therefore no permanent change to groundwater levels and flow direction will occur. Any existing groundwater contribution to habitats will therefore continue.

It is concluded therefore that buffers to potential High and Moderate GWDTE specified in SEPA guidance¹ need not apply, but safeguards will be required during dismantling / construction to maintain existing surface water flow paths to these habitats. Micro-siting (for example of tracks and foundations) will also be required under direction of the project ECOW to safeguard valuable habitats, such as flushes.

Examples of proposed safeguards are provided in **Volume 2, Chapter 6: Water Environment of this EIA Report** which will be included in the final site-specific Construction Environment Management Plan. It also includes the provision of an ECOW to supervise construction works and whom would have the authority to approve drainage measures, and ensure their efficacy, deployed during the project.

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