

**Volume 5: Appendix 13.5 – Groundwater Dependent
Terrestrial Ecosystems (GWDTE) Assessment**

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LIST OF ABBREVIATIONS

AOD:	Above Ordnance Datum
BGS:	British Geological Survey
CEMP:	Construction Environmental Management Plan
DTM:	Digital Terrain Model
ECoW:	Environmental Clerk of Works
EIA:	Environmental Impact Assessment
EIAR:	Environmental Impact Assessment Report
EPZ:	Equipotential zone
GWB:	Groundwater Body
GWDTE:	Groundwater Dependent Terrestrial Ecosystems
LiDAR:	Light Detection and Ranging
LUC:	Land Use Consultants Ltd.
NVC:	National Vegetation Classification
OHL:	Overhead Line
OS:	Ordnance Survey
PWS:	Private Water Supplies
QGIS:	Quantum Geographic Information System
SBL:	Scottish Biodiversity List
SEPA:	Scottish Environment Protection Agency
SSSI:	Site of Special Scientific Interest
SuDS:	Sustainable Drainage Systems
UK Hab:	UK Habitat

1. INTRODUCTION

- 1.1.1 This appendix details the assessment undertaken to identify Groundwater Dependent Terrestrial Ecosystems (GWDTEs) that may be affected by the Kintore to Tealing 400 kV OHL and associated infrastructure (the ‘Proposed Development’) as described in **Volume 1, Chapter 3: Project Description**. This document should be read in conjunction with **Volume 1, Chapter 3: Project Description, Volume 2, Chapter 13: Hydrology, Hydrogeology, Geology and Soils, Volume 2, Chapter 11: Ecology** and **Volume 5, Appendix 11.2: Habitats and Vegetation Survey Report** of the Kintore to Tealing 400 kV OHL Environmental Impact Assessment Report (EIAR). The assessment draws together detailed information from both the hydrology and ecology chapters, summarising where applicable.
- 1.1.2 **Section 2: Identification of GWDTE** of this appendix provides an overview on the process of identification of GWDTEs and describes the GWDTE baseline within 250 m of the Proposed Development infrastructure. **Section 3: Effects Assessment** presents an assessment of effects on GWDTEs, together with recommended mitigation and monitoring measures. **Section 4: Loch of Park** describes the assessment of effects on the Loch of Park Site of Special Scientific Interest (SSSI), which is not a GWDTE, but is a sensitive environmental area, which is mainly fed via surface water but has a groundwater input.
- 1.1.3 GWDTEs are types of wetlands that are specifically protected under the *Water Framework Directive*. GWDTEs should be considered in terms of their hydrology and their ecology. This appendix has been provided to connect the two disciplines of ecology and hydrology by providing information from both disciplines to complete the assessment of potential effects of the Proposed Development on GWDTEs.
- 1.1.4 The assessment methodology follows the methods in **Volume 2, Chapter 13: Hydrology, Hydrogeology, Geology and Soils** of the EIAR to determine the sensitivity of receptor, magnitude of effect and significance of effect, as set out in **Table 13.3: Criteria to Assess the Sensitivity of Receptor, Table 13.4: Criteria for Estimating the Magnitude of Change**, and **Table 13.5: Matrix for Determination of Significance of Effects**.
- 1.1.5 This appendix is supported by:
- **Volume 3, Figure 11.4.1 to 11.4.23: National Vegetation Classification Survey Results**
 - **Volume 3, Figure 13.3.1 to 13.3.15: Groundwater Abstractions, Water Supplies and GWDTE**; and
 - **Annex 13.5.1: Kintore to Tealing 400 kV Overhead Line (OHL) Project – Loch of Park Site Visit – File Note**.
- 1.1.6 The Scottish Environment Protection Agency (SEPA) has produced detailed, updated guidance in 2024¹ on how to assess impacts of proposed development on GWDTEs and the following assessment is based on this SEPA guidance. The SEPA (2024) guidance updates the previous SEPA (2017)² guidance.

¹ SEPA, 2024. Guidance on Assessing the Impacts of Development Proposals on Groundwater Dependent Terrestrial Ecosystems. [online]. Available at: <https://www.sepa.org.uk/media/a1yh0blq/guidance-on-assessing-the-impacts-of-developments-on-groundwater-dependent-terrestrial-ecosystems.docx> [Accessed 20 May 2025].

² 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. Available at: https://www.sepa.org.uk/media/143868/lupsgu31_planning_guidance_on_groundwater_abstractions.pdf

2. IDENTIFICATION OF GWDTE

2.1.1 The following is an excerpt from the EU GWDTE Technical Report³ which defines a GWDTE in the context of the *Water Framework Directive*:

“In order for terrestrial ecosystems to be considered as part of the classification for groundwater bodies (GWBs), they need to be ‘directly dependent’ on the groundwater body (GWB). This means that the GWB should provide quantity (flow, level) or quality of water needed to sustain the ecosystems which are the reasons for the significance of the GWDTE. This critical dependence upon a GWB is most likely where groundwater supplies the GWDTE for a significant part or a significant time period of the year.”

2.1.2 Therefore, for a habitat to be designated as a GWDTE, there must be significant hydrogeologic connectivity between the groundwater body and the habitat.

2.1.3 Potential GWDTEs were initially identified during UKHab (United Kingdom Habitat) and National Vegetation Classification (NVC) surveys (see summary below and details in **Volume 5, Appendix 11.2: Habitats and Vegetation Survey Report**). Potential GWDTEs were then visited by the hydrologists to characterise the hydrogeological connectivity of each habitat unit and to determine the level of groundwater dependency. The results of the GWDTE assessment are described below.

2.2 Habitat and Vegetation Surveys

2.2.1 UKHab classification and NVC surveys were undertaken during the Spring, Summer and Winters of 2023 to 2024. The survey extent and results are described in **Volume 5, Appendix 11.2: Habitats and Vegetation Survey Report**. Where habitat types had potential to support GWDTE vegetation communities, further investigation was undertaken. UKHab habitat types that have potential to support GWDTE communities include:

- grassland - Other neutral grassland;
- heathland and shrub - Lowland Heathland;
- heathland and shrub - Upland Heathland;
- wetland - Purple Moor grass and rush pastures;
- woodlands and Forest - upland birchwoods; and
- woodlands and Forest - wet woodland.

2.2.2 Where appropriate, within habitats coded as above, the NVC method⁴ was used to identify potential GWDTE communities. However, to avoid unnecessary extensive botanical study, where habitat types were obviously attributable to surface water movement, rather than groundwater movement, no NVC was completed. This included, for example, stands of marshy grassland in hollows on steep slopes, and obviously ombrogenous bogs.

2.2.3 However, where water influence was less clear, NVC was completed. As above, NVC data was also considered in light of wider influencing factors. Upon determining the NVC community, a decision tool was used to establish the level of dependency of each community on groundwater. **Table 13.5.1: GWDTE Decision Tool**⁵ below shows the decision-making tool used in determining GWDTE presence.

³ European Commission, 2012. Directorate-General for Environment, Technical report on groundwater dependent terrestrial ecosystems. Technical report. No 6, Publications Office. [Online] Available at: https://circabc.europa.eu/sd/a/0500f8ef-d16b-4086-a152-d783d19bb0b8/Technical_report_No6_GWDTEs.pdf

⁴ Rodwell, J.S. 1991-2000. British plant communities. 5 Volumes. Cambridge University Press.

Table 13.5.1: GWDTE Decision Tool⁵

Criteria	Yes	No
A. Is the GWDTE vegetation evidently influenced by groundwater? (ie base-enriched (M10, M11, M37 and/or M38) and/or discharging from an evident point source such as a spring head (M31, M32, M33).		
If the answer to A is 'Yes' then field assessment ends at this stage and the GWDTE is treated as 'high', as per the guidance. If 'No', continue to B.		
B. Is the GWDTE polygon associated with an evident surface water feature? ie is the vegetation located within one of the following topographic locations:		
Watershed/ridge		
Watercourse		
Floodplain		
Ponding location, pond, loch, etc (localised depression)		
Surface water conveyance (drain, gully, rill, etc.)		
If the answer to B is 'Yes' then the GWDTE polygon is no more than 'Moderate' and very likely to be 'Low'. Additional floristic and environmental data should be collected, including photographs to allow for further, desk-based determination of the groundwater dependency. If 'No', continue to C.		
C. Is the GWDTE polygon associated with an ombrogenous system? ie with blanket bog or wet heath habitat. This is especially relevant to M6:		
Presence/persistence of distinctive bog habitat, species and/or associations.		
Deep peat not confined to depressions/valleys (>0.5 m visible in drains or hagged areas).		
If the answer to C is 'Yes' then the GWDTE is no more than 'Moderate' and very likely to be 'Low'. Additional floristic and environmental data should be collected, including photographs to allow for further, desk-based determination of the groundwater dependency.		

2.3 GWDTE Baseline

- 2.3.1 **Volume 2, Chapter 11: Ecology** and **Volume 5, Appendix 11.2: Habitats and Vegetation Survey Report** present the UKHab survey results, the NVC survey results, and the potential GWDTEs identified. Potential GWDTEs based on ecology surveys are mapped in **Volume 3, Figures 11.4.1 to 11.4.23: National Vegetation Classification Survey Results**. The habitat survey results are discussed in detail in **Volume 5, Appendix 11.2: Habitats and Vegetation Survey Report** and are not repeated here. The GWDTE baseline is presented below.
- 2.3.2 Habitats that have the potential to be groundwater dependent were mapped by the ecology team as shown in **Table 13.5.2: Potential GWDTEs, based on NVC code**. Based on SEPA (2024) guidance, the potential groundwater dependency of these communities, based on the vegetation alone is also provided in the table.

⁵ Botanaeco, 2018. GWDTE Decision Tool. [Online] Available at: <https://botanaeco.co.uk/gwdte> [Accessed Feb 2025].

Table 13.5.2: Potential GWDTEs, based on NVC code

Potential GWDTE NVC Code	Groundwater Dependency as per SEPA (2024)
M6 <i>Carex echinata</i> - <i>Sphagnum fallax/denticulatum</i> mire	High
W4 <i>Betula pubescens</i> – <i>Molina caerulea</i> woodland	High
W7 <i>Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum</i> woodland	High
M15 <i>Trichophorum germanicum</i> - <i>Erica tetralix</i> wet heath	Moderate
M23 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate
M27 <i>Filipendula ulmaria-Angelica sylvestris</i> mire	Moderate
MG9 <i>Holcus lanatus-Deschampsia cespitosa</i> grassland	Moderate
MG10 <i>Holcus lanatus</i> - <i>Juncus effusus</i> rush-pasture	Moderate
W1 <i>Salix cinerea-Galium palustre</i> woodland	Moderate
W6 <i>Alnus glutinosa-Urtica dioica</i> woodland	Moderate

- 2.3.3 Based on the SEPA guidance, NVC classes M15, M23, MG9, MG10, U6, W1 and W6 have the potential to have a **Moderate** dependency on groundwater and M6, W4, and W7 have the potential to have a high dependency on groundwater. Areas of habitat which have the potential to be groundwater dependent are scattered in various locations along the Proposed Development (**Volume 3, Figure 11.4.1 to 11.4.23: National Vegetation Classification Survey Results**). The Proposed Development spans land that is mainly associated with agriculture farming and grazing activities, as well as commercial forestry, in environments where GWDTEs may not be expected to persist. Potentially groundwater dependent areas are noted in several different environments including those associated with rivers/surface water features, hillsides, depressions, open grazing land and groundwater features such as springs. However, it is noted that the areas shown in **Volume 3, Figure 11.4.1 to 11.4.23: National Vegetation Classification Survey Results** often comprise a mosaic of NVC communities, for example, MG10 may only cover 30% of a polygon, with M23 covering 20% and the remaining 50% being comprised of other non-NVC communities (eg often an amalgamation of communities associated with unimproved acidic grassland, marshy grassland, wet heath etc.). To be conservative, the entire polygon was mapped by ecologists as potentially groundwater dependent.
- 2.3.4 The hydrology team considered that several of the habitats that indicate a potential **High** or **Moderate** of groundwater dependency (M6, M23, W4 etc) were generally located close to watercourses (indicating a surface water influence) or associated with topographic depressions and within gullies- without any association or indication of connectivity to groundwater, with some exceptions. In particular, there are several areas of M23 rush pasture, wetland habitat which are associated with surface water, showing no signs of groundwater connectivity. Therefore, it is considered that most of these plant communities have, at-most, low groundwater dependency, and therefore are not GWDTEs.
- 2.3.5 The majority of the **Moderate** dependency potential habitats are associated with MG10 rush pasture and W1 to W6 wet woodland habitat. Some of these are associated with surface water basins and other surface water features, while some are associated with groundwater features. There are some smaller areas of grassland habitat such as MG9 which are often associated with surface water features such as watercourses and likely have at most, low groundwater dependency.
- 2.3.6 Further hydrology and hydrogeological survey investigations were undertaken to determine the level of hydrological connectivity and subsequent groundwater dependency at the potential GWDTE polygons.
- 2.3.7 An initial desk-based investigation was undertaken at the potential GWDTEs to understand the underlying bedrock lithology, superficial geology and fault lines that may indicate the likely presence of groundwater upwelling. The desk-based study also involved a review of hydrology and SEPA future flood maps (river and surface water) to understand where floodplains and other surface water features are located, which may indicate a surface water-dominated environment.

- 2.3.8 GWDTE surveys were undertaken by a hydrologist on several occasions from November 2024 to February 2025 to ground truth the GWDTE polygons noted to have **High** and **Moderate** groundwater potential based on vegetation to establish the level of actual groundwater dependency associated with each.
- 2.3.9 The surveys involved assessing and confirming the hydrology and topography in the area, and where possible identifying groundwater upwellings and indicative features of groundwater upwelling. Where water was visible and available for sampling, in-situ analysis was undertaken utilising Hanna Handsets, which measure multiple parameters (temperature, pH, electrical conductivity, oxygen reduction potential and total dissolved solids) that can provide an indication of the source of the water by the chemical signature (eg either groundwater or surface/rainwater).
- 2.3.10 Based on the desk and site surveys, the hydrology team confirmed eight GWDTEs during the survey, the locations of which are shown in **Volume 3, Figure 13.3.1 to 13.3.15: Groundwater Abstractions, Water Supplies and GWDTE** in the EIAR:
- GWDTE 1 corresponds with the moderate potential W6 community and the moderate potential M23 community;
 - GWDTE 2 corresponds with the moderate potential M23/W11 community;
 - GWDTE 3 corresponds with the moderate potential M23 community;
 - GWDTE 4 corresponds with the moderate potential M23 community;
 - GWDTE 5 corresponds with the moderate potential M23 community;
 - GWDTE 6 corresponds with the moderate potential MG10 community;
 - GWDTE 7 corresponds with the moderate potential M23 community; and
 - GWDTE 8 corresponds with the moderate potential M23 community.
- 2.3.11 It is noted that several of the *potential* GWDTE polygons do have some habitats which have a surface or sub-surface water influence and any proposed access tracks that pass through these areas should include suitable drainage to avoid blocking hydrological pathways and maintain hydrological connectivity. Loch of Park Site of Special Scientific Interest (SSSI) was noted as a surface water dominated sensitive habitat, and although it was not confirmed to be a GWDTE there is a groundwater contribution (dominant surface water contribution) and an assessment of effects and additional mitigation measures for the Loch of Park area is discussed in **Section 4: Loch of Park**.
- 2.3.12 Based on the results of the surveys conducted by hydrologists and ecologists alongside the desk-based assessment, a number of adjustments were made to tower locations to consider the presence of GWDTEs and *potential* GWDTE. Where possible, GWDTEs have been buffered by 250 m for siting towers, and by 100 m for siting access tracks, as per SEPA guidance.
- 2.3.13 However, eight GWDTEs are located within 250 m of Proposed Development infrastructure and as such a detailed assessment is carried out below and further description of each GWDTE is provided in **Table 13.5.3: Details of GWDTEs within 250 m from infrastructure** below. These GWDTEs are located within Sections B, D and F.

Table 13.5.3: Details of GWDTEs within 250 m from infrastructure

Potential GWDE	Phase 1 (UKHab)	NVC	Potential ground-water dependency based on NVC class ¹	Hydro-geological setting	Actual groundwater dependency based on site surveys	Distance from infrastructure
Section B						
GWDTE 1 (identified by hydrologists/ ecologists)	Wet woodland Wetland	W6, M23, M9 - <i>Alnus glutinosa-Urtica dioica woodland</i>	Moderate	A small wetland/ pond area is noted within a small block of wet woodland located at the base of a topographic depression.	Moderate , based on presence of a distinct groundwater signature in water chemistry analysis, alongside geological/historic mapping indicators. Local topography indicates that there will be a surface water contribution to the wetland, but there are several indicators of a raised groundwater table here. Thus, the Moderate dependency was maintained.	GWDTE 1 is 17 m east of tower S153. The working area of tower S153 is directly adjacent to the GWDTE polygon and the access track is ~ 5-10 from the western edge of the GWDTE polygon. Tower S152 working area is around 230 m northeast.
Section D						
GWDTE 2 (identified by hydrologists/ ecologists)	Wet woodland Wetland, Rush Pasture,	W11, M23 (M23b) M23- <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture W11- <i>Quercus petraea-Betula pubescens-Oxalis acetosella</i> woodland	Moderate	The GWDTE polygon is located within a large meander of an unnamed tributary to the Ducat Water, but the area is not located within a topographic depression or an area indicated by SEPA mapping to be at flood risk.	Moderate , based on presence of a distinct groundwater signature in water chemistry analysis, alongside geological/ historic mapping indicators. There is likely surface water input at the area.	GWDTE 2 is 70 m northeast of tower S47 working area, 70 m west of tower S46 working area and 40 m north of access track to towers S46 and S47.
GWDTE 3 (identified by hydrologists/ ecologists)	Wetland, Rush Pasture	M23 (M23b) - <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate	The GWDTE polygon is located in a topographic depression adjacent to (west of) and downslope of a known groundwater upwelling.	Moderate , based on the groundwater upwelling feeding into this area. This is the same groundwater upwelling that flows towards GWDTE 4.	GWDTE 3 is 60 m southeast of tower S29 working area.
GWDTE 4 (identified by hydrologists/ ecologists)	Wetland, Rush Pasture	M23 (M23b) - <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate	The GWDTE polygon is located on the north side of a small hill, in a topographic depression	Moderate , based on the groundwater upwelling in this area. This is the same groundwater upwelling that also	GWDTE 4 is 150 m east of tower S29 working area.

Potential GWDTE	Phase 1 (UKHab)	NVC	Potential ground-water dependency based on NVC class ¹	Hydro-geological setting	Actual groundwater dependency based on site surveys	Distance from infrastructure
				directly beside the road. On the south side of the same hill is a known, surficial groundwater upwelling.	feeds GWDTE 3, a separate polygon.	
GWDTE 5 (identified by hydrologists/ecologists)	Wetland, Rush Pasture	M23/U4 (M23b) - <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate	The GWDTE polygon is located on the east flank of Droop Hill. There are numerous groundwater upwellings and groundwater fed private water supplies (PWS) in the surrounding area. There are numerous linear geological features such as lithological boundaries and fault lines in this area near the main Highland Boundary fault that contribute the increased likelihood of groundwater upwelling.	Moderate , based upon presence of a distinct groundwater signature in water chemistry analysis, alongside geological/historic mapping indicators and known springs in the area.	GWDTE 5 is 40 m northwest of tower S20 working area and 20 m northwest of proposed access track to tower S20. The GWDTE is also upslope and 160 m west of S19.
Section F						
Loch of Park	Wetland, Wet Woodland and forest	M23- <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture W6 <i>Alnus glutinosa-Urtica dioica</i> Woodland S5 <i>Glyceria maxima</i> swamp	Moderate	The <i>potential</i> GWDTE polygon is located within a large topographic basin, through which a large watercourse, the Black Burn (with an over 30 km ² catchment) flows. The Loch of Park is indicated by SEPA mapping as a large floodplain.	Low , based upon significant surface water input at Loch of Park basin, water chemistry analysis, alongside geological/historic mapping indicators (see Annex 13.5.1: Kintore to Tealing 400 kV Overhead Line (OHL) Project – Loch of Park Site Visit – File Note)	Tower N45 lies 100 m northeast, tower N55 40 m east of Loch of Park. Proposed access tracks would lie ~15 m to 40 m to the east.

Potential GWDTE	Phase 1 (UKHab)	NVC	Potential ground-water dependency based on NVC class ¹	Hydro-geological setting	Actual groundwater dependency based on site surveys	Distance from infrastructure
GWDTE 6 (identified by hydrologists/ ecologists)	Grassland	MG10 <i>Holcus lanatus</i> - <i>Juncus effusus</i> rush-pasture	Moderate	The GWDTE polygon is located in grazing fields adjacent to a main road. There is a slight depression in the north of the field where surface water flooding is noted to occur. The area is underlain by granodiorite which is not usually a productive aquifer.	Moderate , based upon presence of a distinct groundwater signature in water chemistry analysis, alongside geological/ historic mapping indicators.	GWDTE 6 located 10 m northwest of tower N50 working area, and 10 m northwest of access track. Also 190 m south of tower N49 working area.
GWDTE 7 (identified by hydrologists/ ecologists)	Wetland, Rush Pasture	M23 (M23b)- <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate	The GWDTE polygon is located in a wetland area adjacent to open arable crop fields and near the Bogendinny Burn. It is not within any indicative SEPA mapped floodplain.	Moderate , based upon presence of a distinct groundwater signature in water chemistry analysis, alongside geological/ historic mapping indicators. There is likely some surface water input at the area.	GWDTE 7 polygon is encroached by tower and working area of tower N13, as well as by proposed access. GWDTE is also 200 m northeast of N14.
GWDTE 8 (identified by hydrologist and confirmed by ecologists)	Wetland, Rush Pasture	M23 (M23a) - <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	Moderate	The GWDTE polygon is located at a spring head on the north facing flank of a hillside which slopes down towards the Park Burn to the north.	High , based upon presence of groundwater upwelling at a spring and a distinct groundwater signature in water chemistry analysis, alongside geological/ historic mapping indicators.	GWDTE 8 is 1 m southeast of tower N6 working area and ~4 m south of proposed access track to tower N6. The access track (existing) is within the GWDTE 8 polygon.

3. EFFECTS ASSESSMENT

3.1 Overall Approach

- 3.1.1 Following ecological identification of potentially groundwater dependent habitats and an assessment of the levels of groundwater dependency of the specific habitats, this section provides an assessment of the potential effects of the Proposed Development upon groundwater flow and quality to each of the identified areas of GWDTE described in **Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**
- 3.1.2 A site-specific qualitative risk assessment of the GWDTE was carried out based on the available data on local geology, hydrology, ecology and hydrogeological regime. There is no available data on sub-surface flows and in the absence of data, it is considered that the movement of sub-surface water is primarily driven by topography.
- 3.1.3 Flow routing analysis was carried out in Quantum Geographic Information System (QGIS) software using the Light Detection and Ranging (LiDAR) Digital Terrain Model (DTM) terrain data, at 1 m resolution, where available. Additionally, the Applicant has undertaken additional LiDAR survey in a corridor along the line of Proposed Development, which was also used in the northern sections of the alignment. Where there was no LiDAR DTM available, topography and indicative surface water flow paths were derived from ordnance survey (OS) contour mapping and site visits. In the absence of data on groundwater levels and groundwater flow paths, analysis of topography and surface water flows paths was used to infer hydrological and hydrogeological connectivity to the project infrastructure.
- 3.1.4 The assessment of impact on a groundwater flow path is made with reference to distance, slope, aspect, typical water table levels and features such as watercourses. This assessment is made with imperfect knowledge of the exact extent that a particular impact may have and imperfect knowledge of specific sub-surface flow paths. As such, it takes a precautionary approach using the available information.
- 3.1.5 Two specific aspects are considered in the assessment. One is the likelihood of an impact upon a flow path feeding an area of groundwater. The second aspect is the likelihood that an area of groundwater may be drained at an unnaturally fast rate following the introduction of drainage for infrastructure, access tracks or tower bases or excavations for this infrastructure penetrating the groundwater table and subsequently lowering groundwater levels.
- 3.1.6 The SEPA Guidance for assessing impacts of development on GWDTEs recommends a 10 m buffer from all project activities, 100 m buffer for excavations <1 m deep, and 250 m buffer zone from all excavations >1 m.
- 3.1.7 Excavations for OHL towers will be ~4 m deep and it is likely that most access tracks, working and laydown areas will require excavations of less than 1 m; however, there may be some areas where more than 1 m of cut is required on access tracks, working platforms and equipotential zone (EPZ) locations, dependent on further detailed design. Given the uncertainty, a precautionary approach has been taken, assuming a 250 m buffer from all Proposed Development infrastructure. A 250 m buffer is shown on **Volume 3, Figure 13.3.1 to 13.3.15: Groundwater Abstractions, Water supplies and GWDTE** in the EIAR.
- 3.1.8 A site-specific assessment of GWDTE 1 to GWDTE 8 follows. Applied mitigation measures (eg Sustainable drainage systems (SuDS) and best practice site management and construction techniques) minimise the risk of runoff of pollution/sediment during construction. Access tracks will also be designed with suitable drainage to enable subsurface flows to be maintained. The full suite of applied mitigation measures is described in **Volume 2, Chapter 13: Hydrology, Hydrogeology, Geology and Soils** and **Chapter 17: Schedule of Mitigation** of the EIAR. The assessment of effects on these GWDTEs is carried out assuming applied mitigation measures are in place and follows the methodology for assessing sensitivity, magnitude and significance of effect as set out in **Section 13.3: Assessment Methodology** of **Volume 2, Chapter 13: Hydrology, Hydrogeology, Geology and Soils**. Additional mitigation and monitoring measures have been considered to reduce the predicted effects on some GWDTE, if required. These additional measures are detailed in the assessment herein and summarised in **Table 13.22: Committed Additional Mitigation Construction in Volume 2, Chapter 13, Hydrology, Hydrogeology, Geology and Soils**.
- 3.1.9 All other *potential* GWDTE polygons mapped by the ecologists based on UK Hab/NVC surveys were considered to have a low dependency on groundwater and are not GWDTEs. Nevertheless, any proposed access tracks that pass

through these areas should include suitable drainage to avoid blocking hydrological pathways and maintain hydrological connectivity. This is noted as a specific applied mitigation measure outlined in **Volume 2, Chapter 13, Table 13.14: Applied Mitigation**. The Loch of Park area is discussed in greater detail in **Section 4: Loch of Park**.

3.2 GWDTE 1- Section B

Sensitivity of GWDTE

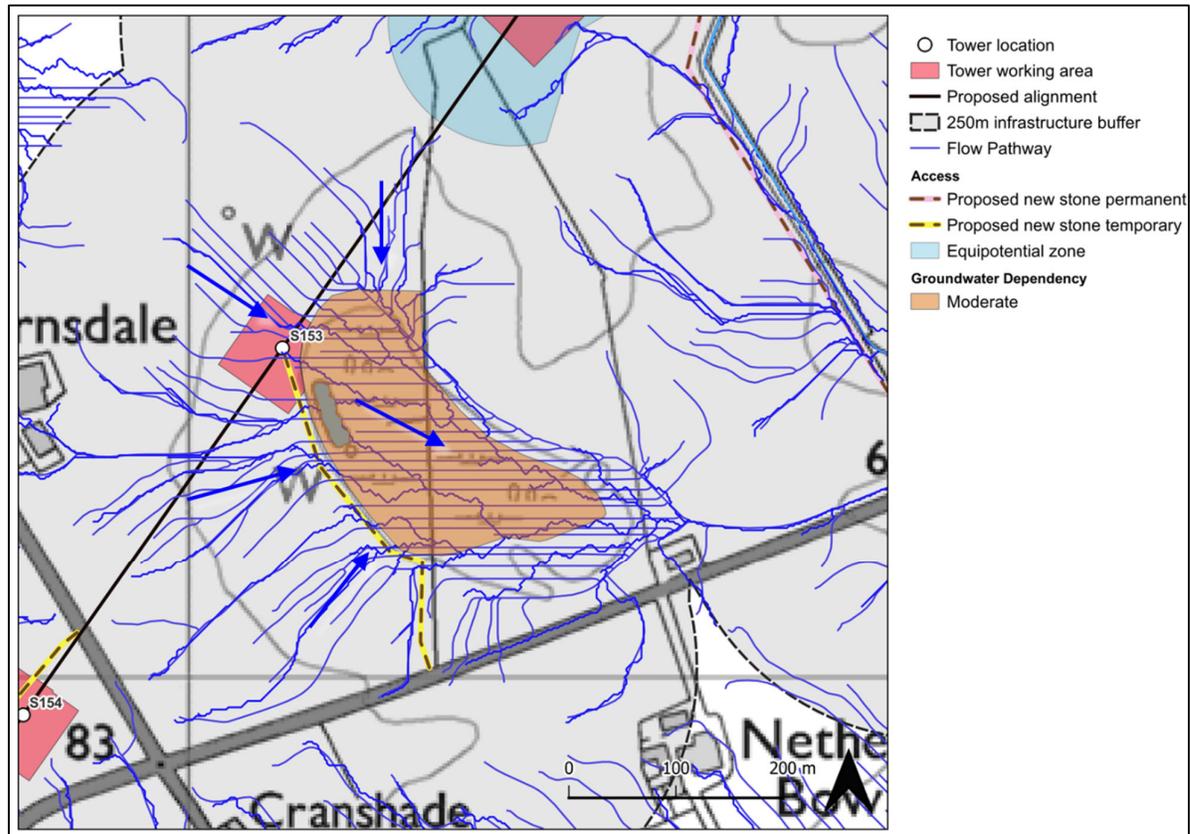
- 3.2.1 GWDTE 1 is located within an area of woodland and boggy ground in the basin of a topographic depression, which surrounding agricultural fields slope downhill towards. Within the woodland depression there is a small pond feature and a historic well. There was not a clear groundwater upwelling here; however, the groundwater chemistry analysis indicated a strong groundwater signature. Based on site survey and desk-based analysis (see **Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**), the GWDTE is considered to be **Moderately** dependent on groundwater.
- 3.2.2 Ecologically, this area comprises a small stand of willow woodland, with an area of rush-dominated vegetation to the southeast. The willow woodland was dominated by grey willow with some limited alder. The ground flora was dominated by nettles in areas of drier conditions, and water horsetail where conditions were increasingly swampy. The vegetation was assessed to be the W6 community, which qualifies as a Scottish Biodiversity List (SBL) priority habitat (Wet Woodland). In addition, W6 can qualify as an Annex I habitat (H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*); however, this woodland was notably small and isolated, being surrounded by intensive agriculture and having no connectivity to a wider alluvial network, and as such is not considered a high-quality example of this habitat type.
- 3.2.3 The adjacent vegetation to the southeast was dominated by soft rush, with tufted hair grass and a range of associated herb species. It comprised a mosaic of wetland communities, that was assessed to include the M23 community (specifically the relatively species-poor M23b *Juncus effusus* sub-community) and MG9 community, with elements of the S28 tall-herb fen community. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures) because it accounts for a significant proportion of the semi-natural wetland vegetation in such situations⁶. However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species, and it does not have good connectivity to further extents of similar habitat. The MG9 community is not recognised for its conservation status.
- 3.2.4 The area comprises a topographic low point, and so the mix of vegetation types, including willow woodland, rush-pasture, and tall-herb fen, is expected to persist. Although the area is small and isolated, with limited connectivity, it supports priority habitat types and a mix of communities which contributes to the diversity of the area. Based on the **Moderate** dependency on groundwater and ecological importance, the sensitivity of the receptor is **Medium**.

Effects Assessment

- 3.2.5 Tower S153 is located 17 m west of the GWDTE polygon and the working area of tower S153 is directly adjacent to the GWDTE polygon. The access track to tower S153 follows the western edge of the GWDTE polygon, ~ 5-10 m west of the polygons edge. The location of the GWDTE is shown below in **Plate 13.5.1: GWDTE 1 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

⁶ NatureScot, n.d. SBL Habitat Description: Purple Moor Grass and Rush Pastures.

Plate 13.5.1: GWDTE 1 and associated infrastructure within 250 m buffer



- 3.2.6 British Geological Survey (BGS) 1:50K bedrock geology mapping indicates that the geology around GWDTE 1 is comprised of sedimentary Scone sandstone formation rocks of fluvial origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). These sedimentary lithologies make up part of the Arthbutnott-Garvock group, a moderately productive aquifer unit, comprised of sandstones, in places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas, locally yielding moderate amounts of groundwater. Flow is virtually all through fractures and other discontinuities.
- 3.2.7 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Devensian Till glacial deposits (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.
- 3.2.8 The GWDTE is located downgradient of tower S153 and the proposed access track to the tower (**Plate 13.5.1: GWDTE 1 and associated infrastructure within 250 m buffer**) in the base of the localised topographic depression. Surface water flow paths indicate that tower S153 working area and the proposed access track drain downslope towards the GWDTE. Tower S153 is ~17 m west of the GWDTE polygon. The proposed temporary access track is ~5 -10 m west of the GWDTE. Therefore, the GWDTE is within the flow pathways from the Proposed Development infrastructure and excavation required at the tower working area has the potential to impact the GWDTE. Thus, there are potential effects on both groundwater quantity and quality.
- 3.2.9 The sensitivity of the GWDTE receptor is considered to be **Medium**. Given the proximity of tower S153, it is considered likely that the excavation will temporarily impact the quantity and quality of groundwater supplying the GWDTE. The duration of effect is difficult to estimate as this is dependent on the groundwater level in the area (which will fluctuate and remains unknown, with no borehole records in the area) but it will likely have an impact during construction and the magnitude of change is considered to be **Medium**. Therefore, without additional mitigation, the significance of effect is considered to be **Moderate** (Significant) during construction.
- 3.2.10 Additional mitigation measures will be put in place during construction to maintain the baseline subsurface flows towards the GWDTE and ensure that proposed infrastructure and construction activities do not alter the natural

drainage conditions and flow pathways of the site and/or compromise water quality. The following specific additional mitigation measures are utilised to reduce the likelihood of any effects on the GWDTE:

- The access tracks will be designed with suitable drainage to enable subsurface flows from higher ground to the west of the GWDTE to be maintained towards the east, so that groundwater flow is available to recharge the GWDTE;
- Additional silt fences, silt traps and SuDS will be emplaced and utilised during construction on the east (downslope) side of the tower working area and along the downslope (east and to a lesser extent, north) side of the proposed access track; and
- These specific measures will be implemented on a case-by-case basis as directed by the Ecological Clerk of Works (ECoW) during construction.

3.2.11 The access track and working areas are temporary and the ground will be restored after construction. Thus, there is not expected to be any long-term effect on hydrology and sub-surface flows to the GWDTE during operation.

3.2.12 Monitoring will be put in place to assess the quantitative and chemical effect of the infrastructure to ensure that the groundwater flow and quality to the GWDTE are not statistically significantly changed post construction. Monitoring will be carried out based on SEPA (2024) guidance and will comprise groundwater monitoring at the tower and at a series of groundwater monitoring wells. Pre-construction monitoring will commence at least twelve months before construction commences. Monitoring reports will be prepared, and remedial actions identified if statistically significant changes to the groundwater flow or chemistries to sensitive receptors are identified.

3.2.13 Additional mitigation measures including the micro-siting of working areas and employing extra SuDS, silt fences etc will reduce adverse effects to groundwater quality from runoff. It is more difficult to assess the residual impact to groundwater quantities and levels. It should be noted that the GWDTE lies in a topographic depression/bowl and the tower would be sited above the GWDTE polygon, thus groundwater would not be lost downslope if the groundwater table is perforated by excavations, as it would seep back to the GWDTE groundwater recharge area. There remains potential for the furthest upslope sections of the GWDTE to have reduced groundwater quantities. With additional mitigation and monitoring the magnitude of effect is considered to be Low resulting in a residual effect of **Minor** significance (Not Significant).

3.3 GWDTE 2- Section D

Sensitivity of GWDTE

3.3.1 GWDTE 2 is located in an area of boggy, wet woodland/rush pasture (**Photo 13.5.1: GWDTE 2, showing boggy wet woodland/rush pasture**) within a large meander of an unnamed tributary to the Ducat Water. The GWDTE is not sited in a topographic depression or an area indicated by SEPA mapping to be at flood risk, the area is largely flat but the GWDTE lies on slightly higher ground than the surrounding area. Based on the site hydrology survey (**Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**), the GWDTE is considered to have a **Moderate - Low** dependency on groundwater.

3.3.2 Ecologically, this comprised an area of birch woodland, with soft rush and grass species dominating the ground flora and an associated range of herb species indicative of the neutral M23 community (specifically the relatively species-poor M23b *Juncus effusus* sub-community). The area is grazed by cattle and was not noted to be especially species-rich. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands, and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species, and it does not have good connectivity to further extents of similar habitat. In addition, the birch woodland is not dependent on groundwater and would be expected to persist. The sensitivity is therefore considered to be no more than **Low**.

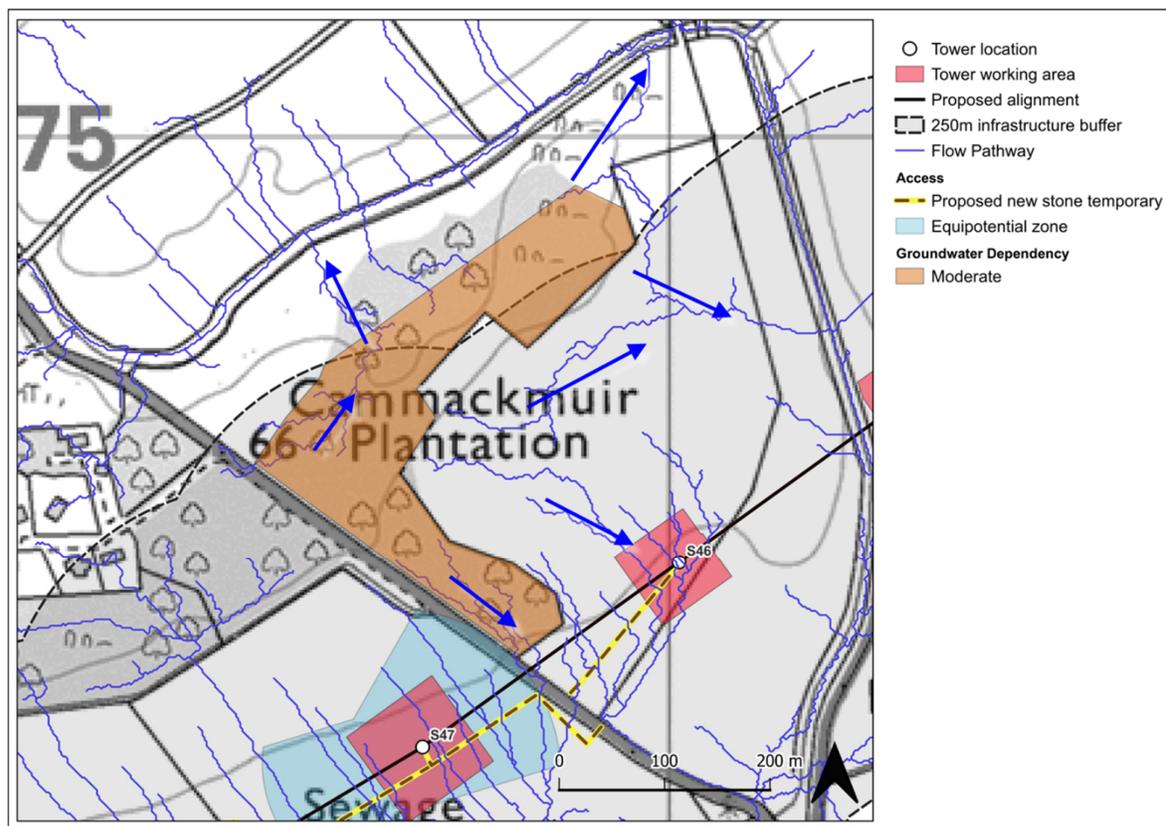
Effects Assessment

3.3.3 Tower S47 working area would be sited 70 m south of the GWDTE and tower S46 around 60 m east of the GWDTE. The access tracks to both these towers would be around 40 m southeast of the GWDTE. The location of the GWDTE is shown in **Plate 13.5.2: GWDTE 2 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Photo 13.5.1: GWDTE 2, showing boggy wet woodland/rush pasture



Plate 13.5.2: GWDTE 2 and associated infrastructure within 250 m buffer



3.3.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 2 is comprised of sedimentary Cromlix mudstone formation rocks of fluvial origin (**Volume 3, Figure 13.4: Bedrock geology** in EIAR). These sedimentary lithologies make up part of the Strathmore group, a moderately productive aquifer unit, comprised of sandstones, in

places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas, locally yielding up to 12 L/s groundwater. Flow is virtually all through fractures and other discontinuities.

- 3.3.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Mill of Forest Till formation glacial deposits (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.
- 3.3.6 The GWDTE is located upgradient of towers S46 and S47 and the associated access track (**Plate 13.5.2: GWDTE 2 and associated infrastructure within 250 m buffer**). Flow pathway analysis indicates that flow paths from the nearby tower working areas and the proposed access tracks drain downslope to the south/southwest away from the GWDTE. Towers S46 and S47 working areas are within 70 m of the GWDTE polygon and excavations may potentially impact the GWDTE. However, it is considered more likely that groundwater levels are controlled by the nearby watercourse (unnamed tributary of Ducat Water).
- 3.3.7 Based on the above, it is considered that excavations for towers S46 and S47 may have a minor, but temporary effect of groundwater levels at the GWDTE and the magnitude is considered to be **Low**, resulting in an effect of **Minor** significance (Not Significant) during construction. There is not expected to be any long-term effect on hydrology and sub-surface flows during operation.
- 3.3.8 No additional mitigation is required, and the residual effects are considered to be **Minor** (Not Significant).

3.4 GWDTE 3- Section D

Sensitivity of GWDTE

- 3.4.1 GWDTE 3 is located in a small, localised depression ~100 m west and downstream of a groundwater spring upwelling. This spring flows both west, feeding the GWDTE 3 polygon area (**Photo 13.5.2: Groundwater feeding into GWDTE 3 from known spring ~100 m east of the GWDTE** and **Photo 13.5.3: GWDTE 3**), and east toward the PWS abstraction for Cushnie Farm Estate. Based on the site hydrology survey (**Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**), the GWDTE is considered to have a **Moderate** dependency on groundwater.
- 3.4.2 Ecologically, this area was a small swamp, dominated by soft rush and water horsetail. Herb species were limited but included species such as meadowsweet and sedges. The dominance of soft rush and the neutral conditions was assessed to be indicative of the M23 community, and more specifically the relatively species-poor M23b *Juncus effusus* sub-community. It was surrounded by scattered willows and may be in the process of succession towards a form of wet woodland. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species. In addition, it is small and isolated, being surrounded by intensive arable agriculture. The sensitivity is therefore considered to be no more than **Low**.

Photo 13.5.2: Groundwater feeding into GWDTE 3 from known spring ~100 m east of the GWDTE



Photo 13.5.3: GWDTE 3



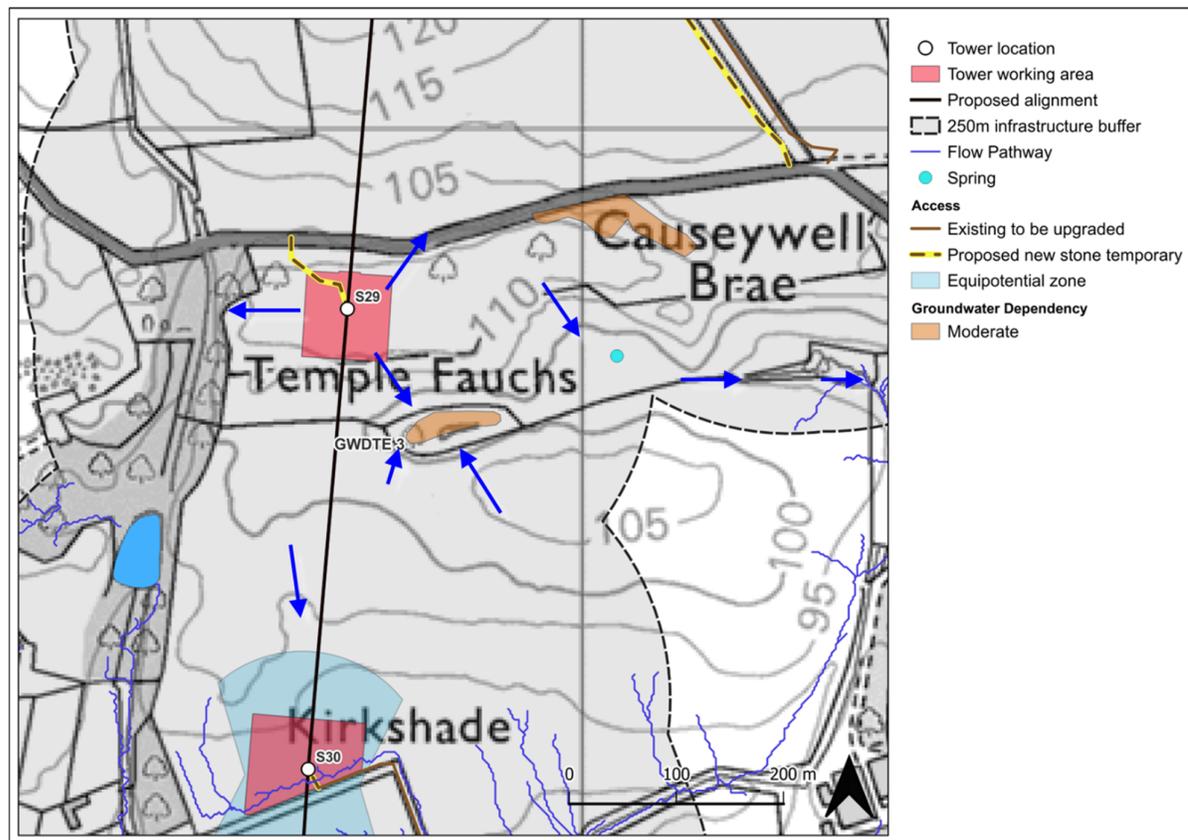
Effects Assessment

- 3.4.3 Tower S29 working area is located ~60 m northwest of the GWDTE. The location of the GWDTE is shown in **Plate 13.5.3: GWDTE 3 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.
- 3.4.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 3 is comprised of sedimentary Cromlix mudstone formation rocks of fluvial origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). These sedimentary lithologies make up part of the Strathmore group, a moderately productive aquifer unit, comprised of sandstones, in

places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas, locally yielding up to 12 L/s groundwater. Flow is virtually all through fractures and other discontinuities.

- 3.4.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Ury Silt Formation sedimentary glacial deposits of clay, silt and sand (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.
- 3.4.6 The GWDTE is located downgradient of tower S29, and therefore groundwater levels are unlikely to be impacted by excavation during construction, as the infrastructure location is over 12 m higher in elevation than the GWDTE and spring location. However, flow pathway analysis indicates there is a potential surface flow pathway from part of the working area of tower S29 towards the GWDTE.
- 3.4.7 Applied mitigation measures (eg construction SuDS, best practice site management and construction techniques) will minimise the risk of pollution/sediment to the GWDTE. Best practice construction techniques will be employed to ensure that the infrastructure does not impact groundwater flow or chemistry to sensitive receptors. With applied mitigation the magnitude of change is considered to be **Negligible** and the significance of effect is considered to be **Negligible** (Not Significant).
- 3.4.8 No additional mitigation is required, and the residual effects are considered to be **Negligible** (Not Significant).

Plate 13.5.3: GWDTE 3 and associated infrastructure within 250 m buffer



3.5 GWDTE 4- Section D

Sensitivity of GWDTE

- 3.5.1 GWDTE 4 is sited in a localised topographic hollow, within a small north-facing gully on the north flank of the hill at Causeywell Brae. The GWDTE is ~120 m north of a groundwater spring upwelling, with the upwelling located on the south flank of the same hill. This spring flows both west, feeding the GWDTE 3 polygon area, and east. There was no obvious groundwater upwelling at GWDTE 4 at the time of survey. Based on the site hydrology survey (**Table 13.5.3:**

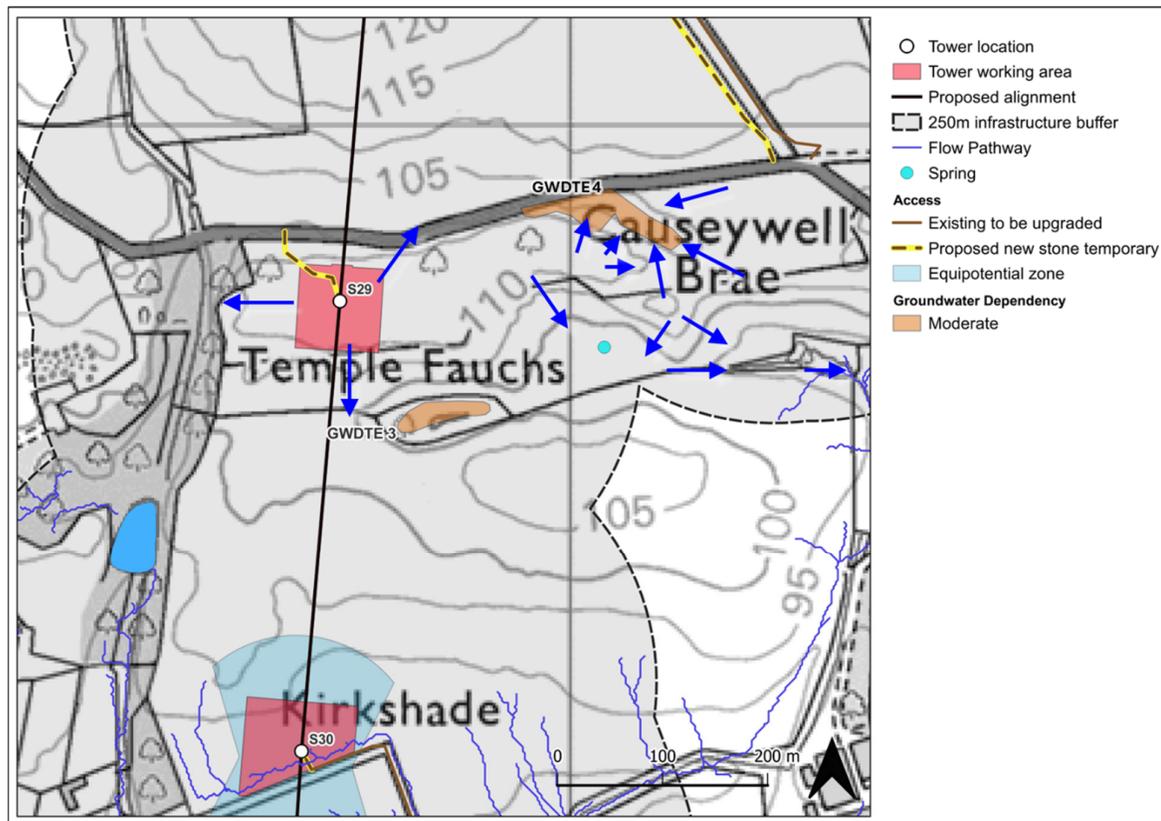
Details of GWDTEs within 250 m from infrastructure), the GWDTE is considered to have a **Moderate** dependency on groundwater.

- 3.5.2 Ecologically, this area was a small swamp, dominated by soft rush and water horsetail. Herb species were limited, but included species such as meadowsweet and sedges. The dominance of soft rush and the neutral conditions was assessed to be indicative of the M23 community, and more specifically the relatively species-poor M23b *Juncus effusus* sub-community. It was surrounded by scattered willows and may be in the process of succession towards a form of wet woodland. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands, and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species. In addition, it is small and isolated, being surrounded by intensive arable agriculture. The sensitivity is therefore considered to be no more than **Low**.

Effects Assessment

- 3.5.3 The proposed working area for Tower S29 would be ~150 m west of GWDTE 4. The location of the GWDTE is shown in **Plate 13.5.4: GWDTE 4 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Plate 13.5.4: GWDTE 4 and associated infrastructure within 250 m buffer



- 3.5.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 4 is comprised of sedimentary Cromlix mudstone formation rocks of fluvial origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). These sedimentary lithologies make up part of the Strathmore group, a moderately productive aquifer unit, comprised of sandstones, in places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas, locally yielding up to 12 L/s groundwater. Flow is virtually all through fractures and other discontinuities.
- 3.5.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Ury Silt Formation sedimentary glacial deposits of clay, silt and sand (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.

- 3.5.6 The GWDTE is located around 5 m lower in elevation than tower S29, and ~150 m east of the tower, therefore groundwater levels are unlikely to be impacted by excavation during construction, as the infrastructure is sited several metres higher than the GWDTE and the spring location which likely feeds this GWDTE. Surface flow pathways, based on the available topographic LiDAR data indicate that there are no flow pathways towards the GWDTE from tower S29 (**Plate 13.5.4: GWDTE 4 and associated infrastructure within 250 m buffer**). Flow paths from the GWDTE slope downhill along the adjacent road to the west, towards the Hungeral Burn, which is ~90 m west of tower S29 working area.
- 3.5.7 Based on the above, it is considered that the Proposed Development will not impact the GWDTE as there are no flow pathways towards the GWDTE from infrastructure and no likelihood of any effect on groundwater levels. The magnitude is considered to be **Negligible** and hence, the significance of effect is **Negligible** (Not Significant).
- 3.5.8 No additional mitigation is required.

3.6 GWDTE 5- Section D

Sensitivity of GWDTE

- 3.6.1 GWDTE 5 is located on the east flank of Droop Hill and is within a large potential GWDTE polygon (based on NVC surveys) ranging in elevation from 165 to 210 m above ordnance datum (AOD). The GWDTE is on steep sloping ground (**Photo 13.5.4: GWDTE 5 on the slopes of Droop Hill**). A spring serves a PWS ~150 m northwest and upslope of the GWDTE. There are reportedly numerous other sub-surface springs in the area, and water chemistry analysis indicated particularly strong groundwater connectivity further downslope, in the east of the GWDTE polygon. Other, separate nearby indicative potential GWDTE polygons identified during NVC surveys on the south flank of Droop Hill did not register similar chemical signals during water chemistry analysis. Based on site surveys (see **Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**), the GWDTE is considered to have a **Moderate** dependency on groundwater.
- 3.6.2 Ecologically, this location comprised a damp field that was dominated by soft rush, with acid grassland species and scattered gorse scrub. It was assessed to be a mosaic of the M23 community (specifically the relatively species-poor M23b *Juncus effusus* sub-community) and a U4 acid grassland. The field is grazed by cattle and was not noted to be especially species-rich. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species. The acid grassland and scrub would be expected to persist and likely retain an element of soft rush. The sensitivity is therefore considered to be no more than **Low**.

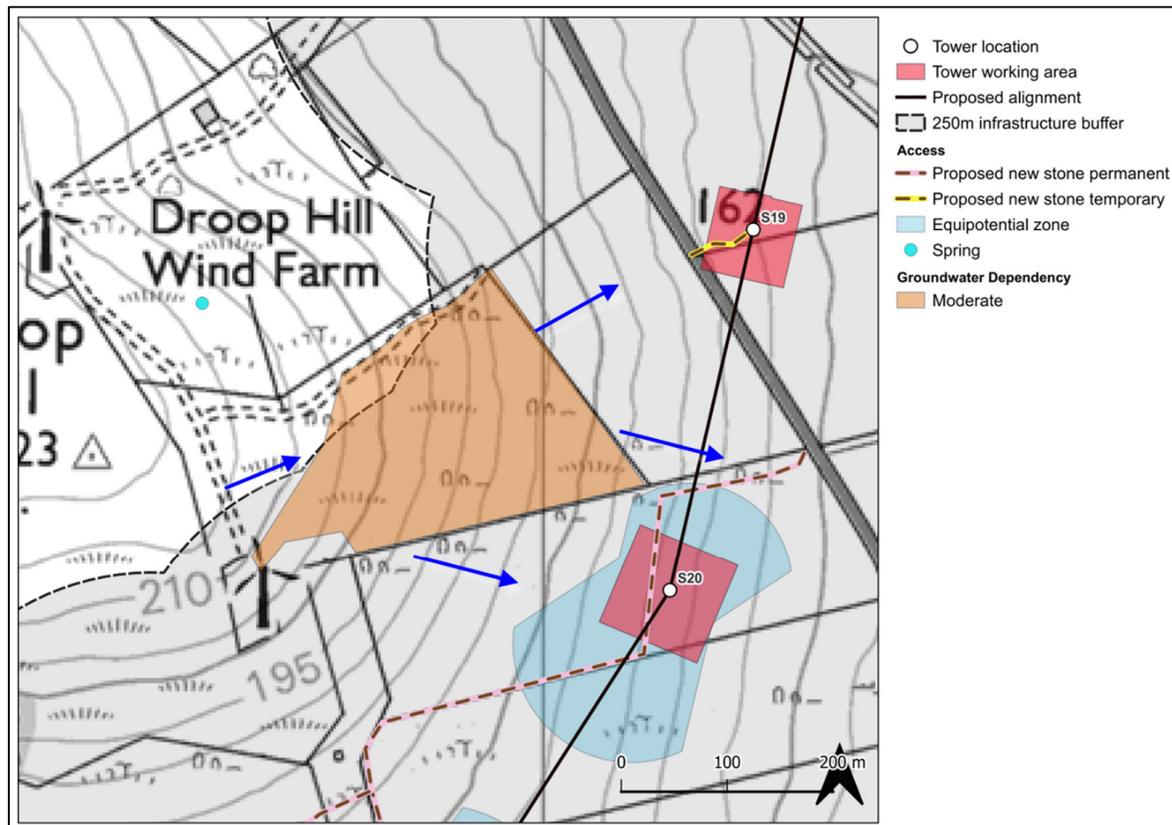
Effects Assessment

- 3.6.3 Tower S20 working area would be located ~35 m south/southeast of the GWDTE and downgradient of the GWDTE at an elevation of ~162 m AOD. The access track would be less than 20 m southeast of the GWDTE at its closest point. The working area of tower S19 would be ~160 m east of the GWDTE and downgradient of the GWDTE at an elevation of ~155 m AOD. The location of the GWDTE with respect to the proposed infrastructure is shown in **Plate 13.5.5: GWDTE 5 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Photo 13.5.4: GWDTE 5 on the slopes of Droop Hill



Plate 13.5.5: GWDTE 5 and associated infrastructure within 250 m buffer



3.6.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 5 is comprised of sedimentary Dunnottar-Crawton Group conglomerate and sandstone rocks of fluvial origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). These sedimentary lithologies make up part of the Dunnottar-Crawton group, a moderately productive aquifer unit, comprised of sandstones, in places flaggy, with siltstones, mudstones and conglomerates and

interbedded lavas, locally yielding moderate volumes of groundwater. Flow is virtually all through fractures and other discontinuities. The surrounding area has numerous significant fault lines aiding the surface appearance of groundwater due to the major Highland Boundary fault zone located around 1-2 km north.

- 3.6.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Mill of Forest Formation glacial deposits (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.
- 3.6.6 There are no flow pathways towards the GWDTE from infrastructure and no significant likelihood of any effect to groundwater quality due to run-off from construction activities. There is however potential for the excavation required at both towers S20 and S19, alongside excavation for the proposed access tracks, to effect groundwater levels and subsequently have an effect on groundwater quantity at the GWDTE.
- 3.6.7 There are uncertainties regarding the groundwater levels at this location and subsequently the potential for groundwater levels to be reduced by construction excavation activities penetrating the groundwater table. There are no borehole records in the area, but surveys and discussions with landowners have indicated a high groundwater table. The likelihood of excavations for the Proposed Development impacting groundwater levels is uncertain without further data on groundwater levels. If the groundwater table is penetrated this could potentially drop the groundwater table elevation permanently. A conservative approach would estimate the magnitude of change on the groundwater supply to the GWDTE as **Medium**. Given the **Low** sensitivity of the GWDTE, the significance of effect without additional mitigation/monitoring is considered to be **Minor** (Not Significant).
- 3.6.8 Additional mitigation measures will be employed in order to reduce the likelihood of any negative effect on groundwater quantity (groundwater levels) and quality from construction activities associated with the proposed infrastructure. The following specific additional mitigation measures will be utilised;
- Groundwater levels will be monitored at the proposed tower locations in advance of construction to assess the risk of a high groundwater table for at least twelve months prior to construction activities commencing. If there is a risk of a high groundwater table, a site-specific mitigation plan for tower construction will be put in place or the tower will be microsited accordingly.
 - Monitoring will also be put in place to assess the quantitative and chemical effect of the infrastructure to ensure that the groundwater flow and quality to the GWDTE are not statistically significantly changed post construction; and
 - Monitoring will be carried out based on SEPA guidance and will comprise groundwater monitoring at the GWDTE, the nearby spring and around Droop Hill at a series of groundwater monitoring wells near the proposed towers. Pre-construction monitoring will commence at least twelve months before construction commences. Monitoring reports will be prepared, and remedial actions identified if statistically significant changes to the groundwater flow or chemistries to sensitive receptors are identified.
- 3.6.9 Additional mitigation and monitoring will reduce the likelihood of any significant effects on the GWDTE, with the magnitude of impact assessed to be low to medium, and the significance of residual effect is considered to be **Negligible to Minor** (Not Significant).

3.7 GWDTE 6- Section F

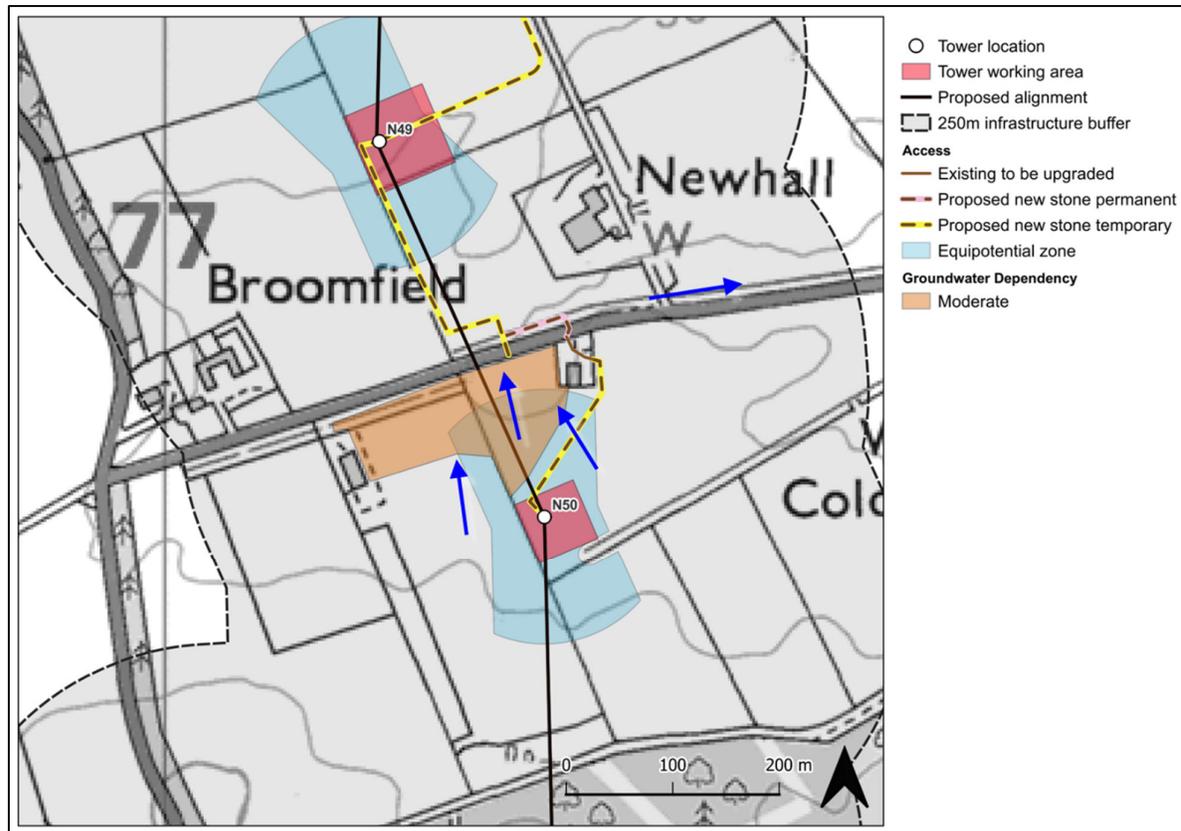
Sensitivity of GWDTE

- 3.7.1 GWDTE 6 is sited within grazing fields between N50 and N49, adjacent to the road north of Coldstream Plantation. The GWDTE area slopes gently downhill toward the north. Based on site surveys (see **Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**), the GWDTE is considered to have **Moderate** dependency on groundwater.
- 3.7.2 Ecologically, this location comprised a damp field that was dominated by soft rush with Yorkshire fog, with limited associated herb species. It was assessed to be MG10 neutral grassland, and was noted to be grazed by sheep. The MG10 community is a fairly impoverished community, and is common throughout the enclosed agricultural lowlands. It is not recognised as being of conservation interest, and this example does not support rare or sensitive plant species. The sensitivity of the GWDTE is therefore considered to be no more than **Low**.

Effects Assessment

- 3.7.3 The working area of tower N50 would be located ~7 m south of the GWDTE at its closest point. The proposed access track curves around the east side of the GWDTE, generally ~15 m east of the GWDTE. The working area of tower N49 would be ~190 m northwest of the GWDTE, with proposed access to this tower starting ~15 m north, across the road and watercourse from the GWDTE. The location of the GWDTE is shown in **Plate 13.5.6: GWDTE 6 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Plate 13.5.6: GWDTE 6 and associated infrastructure within 250 m buffer



- 3.7.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 6 is comprised of the Crathes Pluton Granodiorite of intrusive, igneous origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). This igneous lithology is not very permeable or prone to fracture, thus comprises a low productive aquifer unit known as 'Unnamed Igneous Intrusion, Late Silurian to early Devonian'. There are small amounts of groundwater in near surface weathered zone and secondary fractures; rare springs. Flow is virtually all through fractures and other discontinuities
- 3.7.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Banchory Till Formation- Diamictic glacial deposits (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). There is no peat indicated by the NatureScot Carbon and Peatland mapping (2016) at the GWDTE.
- 3.7.6 Flow pathway analysis indicates there are flow paths directly from the proposed infrastructure at tower N50 and its proposed access track, to the GWDTE. Thus, water quality may be temporarily impacted during construction. Both N49 and N50 are located at higher elevations than the GWDTE, at ~91 m AOD at tower N49 and ~88 m AOD at N50, with the GWDTE located at ~85 – 86 m AOD. It is considered very unlikely that excavation at tower N49 will have any effect on groundwater quantity, as it is significantly higher and a watercourse (upstream extent of Mony Burn) lies between the proposed tower and the GWDTE. Excavations at tower N50 may have a temporary effect on groundwater levels, but as it is elevated slightly above the GWDTE it is considered unlikely. There is proposed scaffolding encroaching over the GWDTE which will be temporarily in place to cross the road; however, scaffolding does not require any excavation and is not considered to have any effect on the groundwater quality or quantity. The

magnitude of change is considered to be **Low to Medium**. The sensitivity of the GWDTE is **Low**, resulting in an effect of **Minor** significance (Not Significant) during construction.

3.7.7 Additional mitigation measures will be put in place at tower N50 and the access track during construction to maintain the baseline subsurface flows towards the GWDTE and ensure that any proposed drainage does not alter the natural drainage conditions of the site and/or compromise water quality. The following specific additional mitigation measures will be utilised;

- Additional SuDS, silt traps/fences will be utilised at the north side of the tower working area and north/west (downslope) side of the access track in order to eliminate any risk of sediment laden run-off effect surface/groundwater quality that may recharge the GWDTE; and
- Specific measures will be implemented on a case-by-case basis as directed by the Ecological Clerk of Works (ECoW) during construction.

3.7.8 Additional mitigation will reduce the magnitude of effects on the GWDTE to **Low to Negligible**, resulting in the residual effects on the GWDTE being of **Minor** or **Negligible** significance (Not Significant).

3.8 GWDTE 7- Section F

Sensitivity of GWDTE

3.8.1 GWDTE 7 is located in low lying fields adjacent to the Bogendinny Burn on its east side and an unnamed tributary to the Bogendinny Burn on its south side (**Photo 13.5.5: GWDTE 7, with groundwater showing oil slick and Hanna Handsets used for water chemistry analysis**). Ground levels slope downhill gently from west to east towards Bogendinny Burn. The GWDTE groundwater dependency here was assessed as **Moderate (Table 13.5.3: Details of GWDTEs within 250 m from infrastructure)**, although there is likely to be a surface water source via the nearby drains and watercourses.

3.8.2 Ecologically, this location comprised a damp field that was dominated by soft rush, with tufted hair grass and a limited range of additional herb species such as marsh thistle and broadleaved dock. Brambles were also noted to be scattered throughout. The dominance of soft rush and the neutral conditions was assessed to be indicative of the M23 community (specifically the relatively species-poor M23b *Juncus effusus* sub-community). The area is isolated, being surrounded by drains, separating it from small areas of extant and felled woodland. The land to the north, west and south is dominated by intensive agriculture. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). However, it is widespread in the lowlands, and this example is not known to support notably rare plants or calcicolous species. The community is on the edge of the basin of Skene Moss, and would be likely to retain an element of soft rush. The sensitivity is therefore considered to be no more than **Low**.

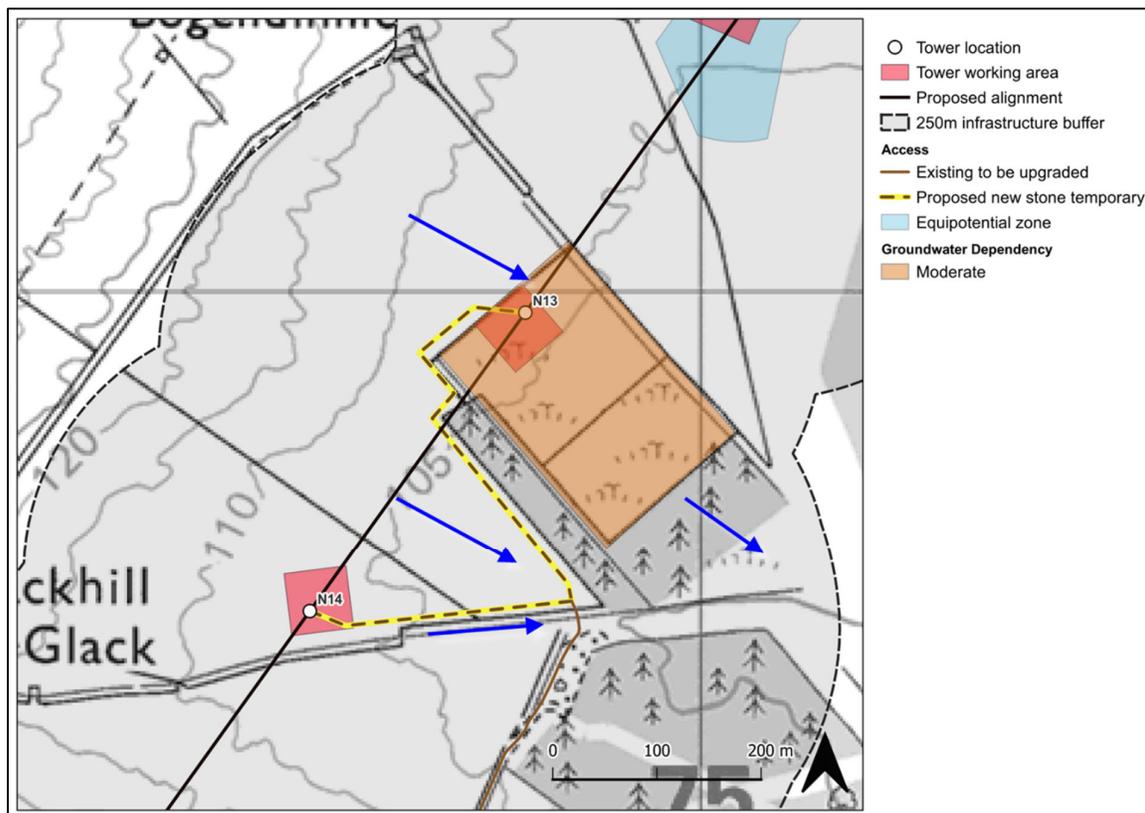
Effects Assessment

3.8.3 Tower N13, the tower working area and access track would be within the GWDTE polygon. The location of the GWDTE is shown in **Plate 13.5.7: GWDTE 7 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Photo 13.5.5: GWDTE 7, with groundwater showing oil slick and Hanna Handsets used for water chemistry analysis



Plate 13.5.7: GWDTE 7 and associated infrastructure within 250 m buffer



3.8.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 7 is comprised solely of the Crathes Pluton Granodiorite of intrusive, igneous origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). This igneous lithology is not very permeable or prone to fracture, thus comprises a low productive aquifer unit known as 'Unnamed

Igneous Intrusion, Late Silurian to early Devonian'. There are small amounts of groundwater in near surface weathered zone and secondary fractures; rare springs. Flow is virtually all through fractures and other discontinuities

- 3.8.5 BGS 1:50K superficial geology maps indicate that the superficial drift geology at the GWDTE comprises Banchory Till Formation- Diamicton glacial deposits and Lacustrine deposits of clay, silt and sand (**Volume 3, Figure 13.5: Superficial Geology** in EIAR). The NatureScot Carbon and Peatland mapping (2016) indicates Class 4 peat at the GWDTE. Peat probing undertaken in June 2024 showed the vast majority of probes depths at Tower N13 were under 50 cm deep, with one probe recording a depth of 52 cm.
- 3.8.6 The tower, access track and working areas would be within the GWDTE polygon at its upslope (northwest) extent. Therefore, there are flow pathways through the rest of the GWDTE polygon from the infrastructure and potential likelihood of effects to both groundwater quality due to run-off from construction activities and quantity due to excavation effecting groundwater levels. Given the proximity to watercourses, groundwater levels in the area are likely controlled to some extent by the nearby watercourses but groundwater levels may be impacted by the construction of the Proposed Development on a temporary basis. The magnitude of change is considered to be **Medium**. Given the **Low** sensitivity of the receptor, the significance of effect is considered to be **Minor** (Not Significant).
- 3.8.7 Additional mitigation measures will be put in place at tower N13 during construction to maintain the baseline subsurface flows towards the GWDTE and ensure that any proposed infrastructure and associated drainage does not alter the natural drainage conditions of the site and/or have any negative effects on ground/surface water quality/quantity. The following specific additional mitigation measures will be utilised;
- Additional SuDS, silt traps/fences will be utilised on the downslope (southeast and east) side of the access track and around the tower working areas west, south and east sides, in order to eliminate the risk of sediment laden run-off flowing in to the GWDTE;
 - Further, the access tracks will be designed with suitable drainage to enable subsurface flows to be maintained so as not to impede groundwater recharge at the GWDTE; and
 - Specific measures will be implemented on a case-by-case basis as directed by the ECoW during construction.
- 3.8.8 Additional mitigation will likely reduce the magnitude of effects to **Low** and the residual effects are considered to be of **Minor** significance (Not Significant).

3.9 GWDTE 8- Section F

Sensitivity of GWDTE

- 3.9.1 GWDTE 8 is located on the north facing slopes of Drum Hill, as it slopes downhill to the north, towards Park Burn. The groundwater dependency here was assessed as **High** (**Table 13.5.3: Details of GWDTEs within 250 m from infrastructure**) as it is fed by a groundwater spring which is also used as a private water supply (**Photo 13.5.6: Spring source which feeds GWDTE 8, also a Private Water Supply abstraction, guarded by fencing**). An obvious surface flow was observed at the spring.
- 3.9.2 Ecologically, this location comprised a low, damp area dominated by sharp-flowered rush, with Yorkshire fog and tufted hair grass, and a limited range of additional herb species such as marsh thistle and cuckooflower. The dominance of sharp-flowered rush and the neutral conditions was assessed to be indicative of the M23 community (specifically the M23a *Juncus acutiflorus* sub-community). The area is fairly small, and is surrounded by acid grassland and gorse scrub, and as such has limited connectivity. The M23 community contributes to the diversity of habitats within the enclosed agricultural lowlands and is recognised in the SBL as a priority habitat (Purple Moor Grass and Rush Pastures). Although this example was the M23a sub-community (which is generally slightly more species-rich than M23b), this area is not known to support notably rare plants or calcicolous species, and the community is widespread in the lowlands. The ecological sensitivity is considered to be no more than **Low**, however given the high groundwater dependency, spring importance for supporting species and clear connectivity between the spring and habitat the overall sensitivity is considered to be **Medium**.

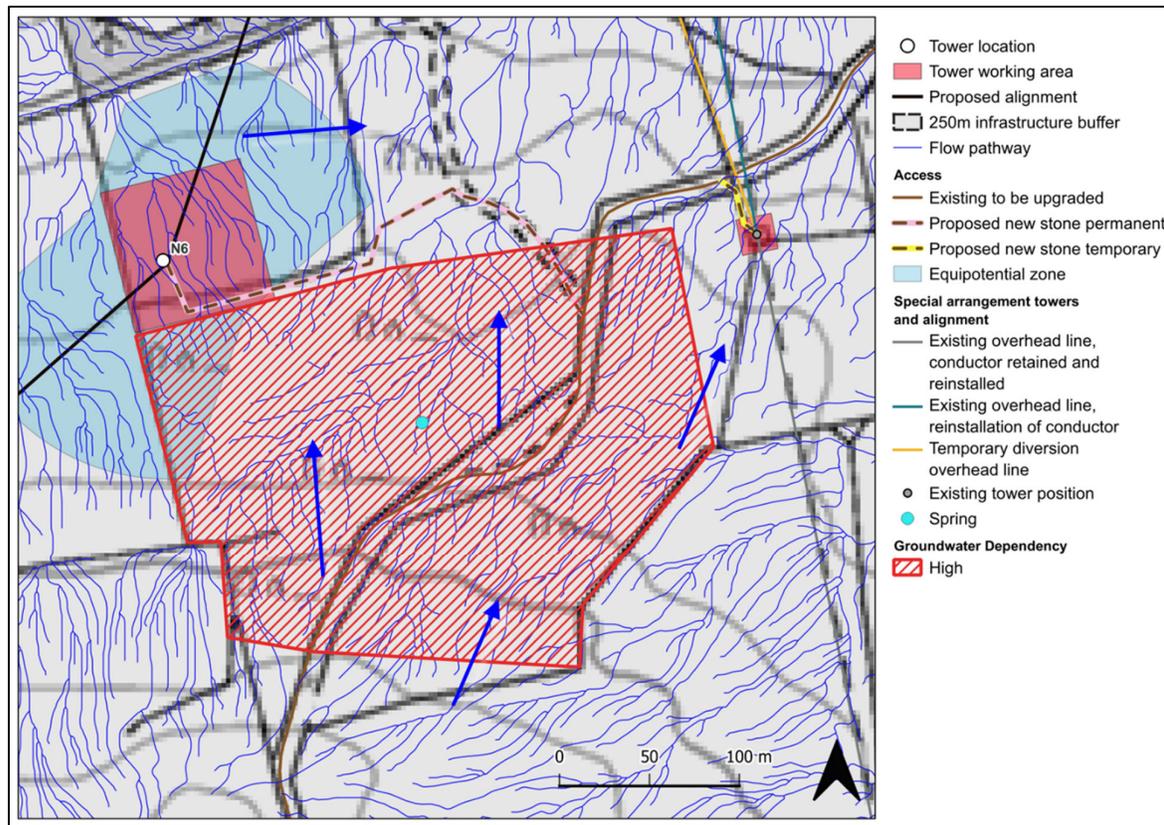
Effects Assessment

- 3.9.3 The working area of tower N6 is located ~1 m north of the GWDTE at its closest point. The access track to tower N6 encroaches within the GWDTE for a length of ~43 m and is directly adjacent to the GWDTE polygon, although it is noted that the track within the GWDTE polygon is utilising an existing access track. The Applicant has confirmed that any new access track will be micro-sited out of the GWDTE in advance of construction. Tower N6 is at an elevation of ~113 m AOD and would be downgradient of the spring feeding the GWDTE, which is at ~118 m AOD. The location of the GWDTE is shown in **Plate 13.5.8: GWDTE 8 and associated infrastructure within 250 m buffer** and described in context with available geological, peat and hydrological information.

Photo 13.5.6: Spring source which feeds GWDTE 8, also a Private Water Supply abstraction, guarded by fencing



Plate 13.5.8: GWDTE 8 and associated infrastructure within 250 m buffer



- 3.9.4 BGS 1:50K bedrock geology mapping indicates that the geology at GWDTE 8 is comprised of the Kemnay Pluton Granite of intrusive, igneous origin (**Volume 3, Figure 13.4: Bedrock Geology** in EIAR). This igneous lithology is not very permeable or prone to fracture, thus comprises a low productive aquifer unit known as 'Unnamed Igneous Intrusion, Ordovician to Silurian'. There are small amounts of groundwater in near surface weathered zone and secondary fractures; rare springs. Flow is virtually all through fractures and other discontinuities.
- 3.9.5 BGS 1:50K superficial geology maps indicate that there is no superficial drift geology coverage around the GWDTE polygon area, with Banchory Till Formation- Diamicton glacial deposits and Lacustrine deposits of clay, silt and sand, indicated nearby (**Volume 3, Figure 13.5: Superficial Geology** in EIAR).
- 3.9.6 Flow pathway analysis utilising LiDAR DTM topographic data indicates there are no flow paths directly from the proposed infrastructure at Tower N6 and its proposed access track, to the GWDTE. However, the access track wraps directly around the north boundary of the GWDTE polygon extent. Tower N6 would be located downslope of the GWDTE at around 113 m AOD. There is therefore potential for excavation at the tower and access track to impact groundwater levels and subsequently impact the quantity of water at the spring which is feeding the GWDTE. There are uncertainties regarding the groundwater levels here and there is the potential for levels to be reduced by construction excavation activities penetrating the groundwater table. There are no borehole records in the area and other borehole records closer to Kintore town do not provide any indication of groundwater levels. However, the presence of the spring indicates that locally there must be an elevated groundwater table. The likelihood of effects on groundwater levels is ambiguous at present and also the longevity of the effect is uncertain, if the groundwater table is penetrated in a worst-case scenario, this could drop the groundwater table elevation permanently and potentially cut off the spring. The likely magnitude of change on the spring/ groundwater levels is **Medium**. Subsequently, the significance of effect on the GWDTE prior to additional mitigation is considered to be **Moderate** (Significant).
- 3.9.7 Additional mitigation measures will be put in place during construction to maintain the baseline subsurface flows towards the GWDTE and ensure that any proposed infrastructure and associated drainage does not alter the natural drainage conditions of the site and/or have any negative effects on ground/surface water quality/quantity. The following specific additional mitigation measures will be utilised;

- Additional SuDS and silt traps will be utilised on the proposed permanent access track to N6, on both its upslope and downslope sides (north and south). Additional SuDS and silt traps/fences will also be utilised on both sides of the existing access tracks to the south of the spring and tower N6.
- Groundwater monitoring will be undertaken at the proposed tower location for tower N6 for at least twelve month prior to the commencement of construction activities. If there is a risk of a high groundwater table, a site-specific mitigation plan for tower construction will be put in place or the tower will be microsited accordingly.
- Groundwater monitoring will also be carried out at the spring and within the GWDTE upslope of tower N6, at least twelve month prior to the commencement of construction activities. Monitoring will be carried out based on SEPA guidance and will assess the quantitative and chemical effect of the infrastructure to ensure that the groundwater flow and quality to the GWDTE are not statistically significantly changed post construction. Monitoring reports will be prepared, and remedial actions identified if statistically significant changes to the groundwater flow or chemistries to sensitive receptors are identified.
- Specific measures will be implemented on a case-by-case basis as directed by the ECoW during construction.

3.9.8 Additional mitigation and monitoring will reduce the magnitude of impact to low on the GWDTE and the significance of the residual effects are considered to be **Minor** (Not Significant).

4. LOCH OF PARK

- 4.1.1 Loch of Park is located in a large topographic depression, within the catchment of a large watercourse, the Black Burn, which has a catchment of over 30 km² upstream. NVC survey indicated mostly **Moderate potential** groundwater dependency NVC communities, with one small polygon indicating high *potential* groundwater dependency. The majority of the Loch of Park area is considerably boggy (**Photo 13.5.7: Loch of Park, most of the basin is very boggy with deep peat**). It was assessed as a low dependency GWDTE and is therefore not considered as a GWDTE (see **Annex 13.5.1: Kintore to Tealing 400 kV Overhead Line (OHL) Project – Loch of Park Site Visit – File Note**). The Loch of Park is also a SSSI. The main Loch of Park basin lies within the 200-year plus climate change floodplain. There is a chalybeate spring at the King's Well (**Photo 13.5.8: King's Well, no flow observed upwelling during survey**), located ~ 40 m northeast of the Loch of Park, which drains into the east side of Loch of Park. No NVC communities with potential groundwater dependency were noted at the spring source.
- 4.1.2 Tower N54 would be located ~100 m northeast of the Loch of Park and tower N55 located ~ 60 m east. Proposed temporary access track infrastructure would be in closer proximity, ~15 m east of the Loch of Park at the proposed access to tower N55 and ~40 m east for tower N54.
- 4.1.3 BGS 1:50K bedrock geology mapping indicates that the geology at Loch of Park is comprised of the Crathes Pluton Granodiorite of intrusive, igneous origin (**Volume 3, Figure 13.4: Bedrock Geology** in the EIAR). This igneous lithology is not very permeable or prone to fracture, thus comprises a low productive aquifer unit known as 'Unnamed Igneous Intrusion, Late Silurian to early Devonian'. There are small amounts of groundwater in near surface weathered zone and secondary fractures; rare springs. Flow is virtually all through fractures and other discontinuities.

Photo 13.5.7: Loch of Park, most of the basin is very boggy with deep peat

