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MONA OFFSHORE WIND PROJECT

Environmental Statement

Volume 7, Annex 1.2: Groundwater sources of supply – hydrogeological risk assessment

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Image of an offshore wind farm

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Glossary

Term	Meaning
Abstraction licence	The authorisation granted by Natural Resource Wales to allow the removal of surface water or groundwater.
Aquifer	A water-bearing geological unit that can yield economically viable amounts of groundwater.
Groundwater	Water that is contained in underground rocks and sediments below the ground surface.
Groundwater Body	Groundwater bodies are the discrete groundwater management units defined by the Environment Agency as required under Article 5 of the Water Framework Directive.

Acronyms

Acronym	Description
BGS	British Geological Survey
CCBC	Conway County Borough Council
CLG	Clwyd Limestone Group
DCC	Denbighshire County Council
EF	Elwy Formation
GHGC	Geology, hydrogeology and ground conditions
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
NRW	Natural Resource Wales
PWS	Private Groundwater Supply Source
WG	Warwickshire Group

Units

Unit	Description
L/s	Litres per second
m	Metres
mAOD	Metres above Ordnance Datum
km	Kilometres

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1 GROUNDWATER SOURCES OF SUPPLY – HYDROGEOLOGICAL RISK ASSESSMENT

1.1 Introduction

1.1.1 Overview

1.1.1.1 This technical report provides a summary of the hydrogeological risk assessment undertaken with respect to licensed groundwater abstractions and private groundwater supply sources identified within the geology, hydrogeology and ground conditions (GHGC) study area. This technical report supports the assessment of effects presented in Volume 3, Chapter 1: Geology, hydrogeology, and ground conditions of the Environmental Statement.

1.1.1.2 The aim of this technical report is to determine the risk posed to any groundwater dependent supply sources from the construction of the onshore elements of the Mona Offshore Wind Project and to identify appropriate mitigation measures.

1.1.2 Study area

1.1.2.1 The study area to be used for the assessment of GHGC focuses on areas located above Mean High Water Springs (MHWS) where potential impacts are most likely to occur on geological and hydrogeological receptors. As such, the GHGC study area includes:

- The area of land to be temporarily or permanently occupied during the construction, operation and maintenance and decommissioning of the Mona Offshore Wind Project (hereafter referred to as the Mona Onshore Development Area)
- Geological and hydrogeological receptors within 1 km of the Mona Onshore Development Area. The 1 km buffer was used as impacts on geological, hydrogeological and ground conditions receptors are most likely to occur within this distance
- Ground condition constraints within the Mona Onshore Development Area.

1.1.2.2 The GHGC is shown on Figure 3.1 of Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the Environmental Statement.

1.1.3 Data sources

1.1.3.1 The assessment presented in this technical report is based on data acquired from the following sources:

- Consultation with Natural Resources Wales (NRW), Conway County Borough Council (CCBC) and Denbighshire County Council (DCC)
- Survey and/or questionnaire responses from landowners within the GHGC study area
- Publicly available geological and hydrogeological information, most notably from the British Geological Survey (BGS) and NRW and described in the Section 1.4 baseline environment of Volume 3, Chapter 1: Geology, hydrogeology, and ground conditions of the Environmental Statement

- Geological and hydrogeological information taken from Groundsure Insights Report obtained for the GHGC study area.

1.1.4 General approach

1.1.4.1 A qualitative assessment approach has been used to determine the risk to all groundwater dependent supply sources identified within the GHGC study area. This methodology is based on the principle of Source-Pathway-Receptor linkages as defined in statutory guidance on Land Contamination Risk Management (Environment Agency, 2023).

1.1.4.2 A hydrogeological model is first defined to determine whether a pathway linking each groundwater dependent supply sources to the Mona Onshore Development Area is likely to exist. Where a plausible pathway is expected to be present, an assessment of the potential severity (i.e. magnitude) of the effect is made in relation to construction and operational activities proposed as part of the Maximum Design Scenario (MDS). That assessment severity of consequence is based on the characteristics of the pathway defined and nature of the activity considered.

1.1.4.3 The principal activities considered as part of this assessment are related to groundwater dewatering in excavations, accidental spillages/emissions or other effects on groundwater quality.

1.1.4.4 Once the level of risk has been assessed appropriate measures are recommended to mitigate the risk to the groundwater supply source. Those mitigations reflect the level or perceived risk and level of certainty in the assessment.

1.2 Site setting

1.2.1 Geology and hydrogeology

1.2.1.1 A summary of the geological units present within the GHGC study area relevant to the risk assessment is provided in Table 1.1, along with their respective aquifer designation. The geology across the GHGC study area is shown in Figure 1.1.

Table 1.1: Regional geology and hydrogeological classification for the GHGC study area.

Era	Group	Formation	Description*	Thickness*	Aquifer designation (NRW)	BGS hydrogeological description
Superficial geology						
	Glacial Till (Devensian)		Unconsolidated mixed deposit consisting of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape	-	Secondary Undifferentiated	Not described
	Glaciofluvial Deposits		Unconsolidated material by glacial river waters and consisting of boulders, gravel, sand, silt and clay from ice sheets or glaciers.	-	Secondary A	Not described
Bedrock geology						
Carboniferous	Warwickshire Group		Predominantly red, brown or purple-grey sandstone, siltstone and mudstone, some grey strata, coals not common, local conglomerates, localised beds of limestone.	Up to 1200 m	Secondary A	Not described
	Clwyd Limestone Group		Diverse range of limestone facies with subordinate sandstone and mudstone units.	Up to 900 m	Principal	Moderately productive aquifer. Flow is virtually all through fractures and other discontinuities. Massive karstic limestone aquifer with rapid response to rainfall. Yields highly variable from dry to 40 L/s
	Not Applicable	Ffernant Formation (formerly the Carboniferous Basement Beds)	Red, purple and variegated silty mudstones, siltstones and sandstones with lenticular bodies of conglomerate.	Up to 330 m	Secondary A	Not described
Silurian	Not Applicable	Elwy Formation	Silty mudstones and subordinate sandstones with lateral facies changes.	>1750 m	Secondary B (Sandstones horizons Secondary A)	Low productivity aquifer. Flow is virtually all through fractures and other discontinuities. Highly indurated argillaceous rocks with limited groundwater.

1.2.1.2 The most important aquifer units within the GHGC study area are the limestones of the Clwyd Limestone Group (CLG) and sandstones of the Warwickshire Group (WG). These geological units are designated Principal aquifers and Secondary A aquifers respectively.

1.2.1.3 The limestones of the CLG are often karstic in nature and are unpredictable in terms of their permeability distribution and characterised by a low storage potential. Beneath areas of high ground, the water table within the CLG limestone aquifer can be located at considerable depth below the ground surface. These limestones have little primary porosity or permeability with groundwater storage and movement typically restricted to solution enlarged fractures. As these fractures are not regularly spaced, nor extensively interconnected failure to intersect a water-bearing fracture commonly results in a dry or low yielding borehole.

1.2.1.4 The underlying mudstones, siltstones and sandstone of the Ffernant Formation are classified a Secondary A aquifer unit, reflecting their potential to be of local resource importance. Similarly, the overlying sandstones, siltstones and mudstones of the WG are classified a Secondary A aquifer unit. The sandstones of the WG are groundwater bearing, however Warren et al. (1984) state that these sandstones are well cemented giving them very low permeability.

1.2.1.5 The Silurian bedrock of the Elwy Formation (EF) underly the upland areas of the GHGC study area. The mudstones and siltstones that dominate the EF have little intergranular porosity and low permeability. Groundwater in this formation is therefore restricted to fractures and faults typically in in sandstone units within the EF or are associated with the upper weathered zone of the EF typically at shallow depth. The Elwy Formation is classified a Secondary B aquifer unit reflecting its low permeability and the fact groundwater is typically of little resource importance.

1.2.1.6 Given this hydrogeological setting, it is evident that licensed groundwater abstractions and private groundwater supply sources shown in Figure 1.1 are typically either:

- Deep boreholes constructed in the limestones of the CLG or sandstones of the WG
- Shallow springs, catch pits or wells constructed in the EF.

1.2.2 Licensed groundwater abstractions

1.2.2.1 A total of 14 licensed groundwater abstractions have been identified in the GHGC study area. Those abstractions are shown in Figure 1.1 and summarised in Table 1.2. Only two of the licensed groundwater abstractions were shown to be active, namely GWA_06 and GWA_07. Both abstraction sources are situated above the WG bedrock aquifer in the in St Asaph area, approximately 1.6 km northeast of the Mona Onshore Development Area.

Table 1.2: Licensed groundwater abstractions within the GHGC study area.

RPS ID	Point name	Status	Geology/ aquifer	Licence number	Notes
GWA_01	Borehole A	Historical	Clwyd Limestone Group	24/66/7/0044	Approximately 1.4 km from the Mona Onshore Development Area.
GWA_02	Borehole at Bryn Pin Mawr	Historical	Clwyd Limestone Group	24/66/6/0013	Approximately 50 m from the Mona Onshore Development Area.
GWA_03	Mine adit	Historical	Clwyd Limestone Group	24/66/7/0016	Approximately 1.2 km north from the Mona Onshore Development Area.
GWA_04	Well b - St. Asaph livestock market	Historical	Warwickshire Group	24/66/6/0017	Approximately 1.6 km northeast from the Mona Onshore Development Area
GWA_05	Well	Historical	Warwickshire Group	24/66/6/0004	Approximately 1.8 km east from the Mona Onshore Development Area.
GWA_06	Well b - St. Asaph livestock market	Active	Warwickshire Group	24/66/6/0017	Approximately 1.6 km northeast from the Mona Onshore Development Area.
GWA_07	Well a - St. Asaph livestock market	Active	Warwickshire Group	24/66/6/0017	Approximately 1.6 km northeast from the Mona Onshore Development Area.
GWA_08		Historical	Warwickshire Group	WA/466/0006/ 0003	Approximately 1.6 km northeast from the Mona Onshore Development Area.
GWA_09	8m deep, 250mm diameter borehole (superficial deposits)	Historical	Superficial deposits / Warwickshire Group	24/66/6/0011	Approximately 1.6 km northeast from the Mona Onshore Development Area.
GWA_10	Borehole at St. Asaph Mart	Historical	Warwickshire Group	24/66/6/0017	Approximately 1.6 km northeast from the Mona Onshore Development Area
GWA_11		Historical	Warwickshire Group	WA/466/0006/ 0003	Approximately 1.6 km northeast from the Mona Onshore Development Area.
GWA_12	109m deep, 114mm dia. Borehole.	Historical	Clwyd Limestone Group	24/66/6/0012	Approximately 1.7 km from the Mona Onshore Development Area.
GWA_13	Well	Historical	Warwickshire Group	24/66/6/0002	Approximately 1.9 km from the Mona Onshore Development Area.
GWA_14	100m deep, 120mm diameter borehole	Historical	Warwickshire Group	24/66/7/0043	Approximately 1 km from the Mona Onshore Development Area.

1.2.3 Private groundwater supply sources

1.2.3.1 A total of nine private groundwater supply sources have been identified in the GHGC study area through consultation with CCBC, DCC and landowner surveys. The nine private groundwater supply sources are listed in Table 1.3. The location of those nine private groundwater supply sources is shown in Figure 1.1 (Ref. PWS 01 to PWS 09 inclusive).

1.2.3.2 It is notable that groundwater supply source PWS 09 corresponds to licensed groundwater abstraction source GWA_01, despite GWA_01 stated to be historical (i.e. not an active source). This source has therefore been assessed as an active Private Groundwater Supply Source, namely PWS 09.

Table 1.3: Private Groundwater Supply Sources within the GHGC Study Area.

RPS ID	Description	Geology/aquifer	Notes
PWS 01	Not specified	Clwyd Limestone Group	Source is approximately 370 m northeast of the Mona Onshore Development Area.
PWS 02	Not specified	Elwy Formation	Source is approximately 180 m southwest of the Mona Onshore Development Area.
PWS 03	Spring fed groundwater catchment tank	Elwy Formation	Source is approximately 1 km south/southwest of the Mona Onshore Development Area.
PWS 04	Gravity fed spring serving multiple properties	Elwy Formation	Source is approximately 575 m south/southeast of the Mona Onshore Development Area.
PWS 05	Spring supply	Elwy Formation	Source is approximately 1 km south of the Mona Onshore Development Area.
PWS 06	Not specified	Currently Unknown	The location of the groundwater supply source and tied property are currently unknown
PWS 07	12ft deep well used daily for agricultural purposes.	Currently Unknown	The location of the groundwater supply source and tied property are currently unknown
PWS 08	Shallow well, used daily.	Elwy Formation	Source is approximately 35 m from the Mona Onshore Development Area.
PWS 09	90m deep borehole serving multiple properties and agricultural business.	Clwyd Limestone Group	Source point is taken as the farmstead located approximately 1.5 km north/northeast of the Mona Onshore Development Area.

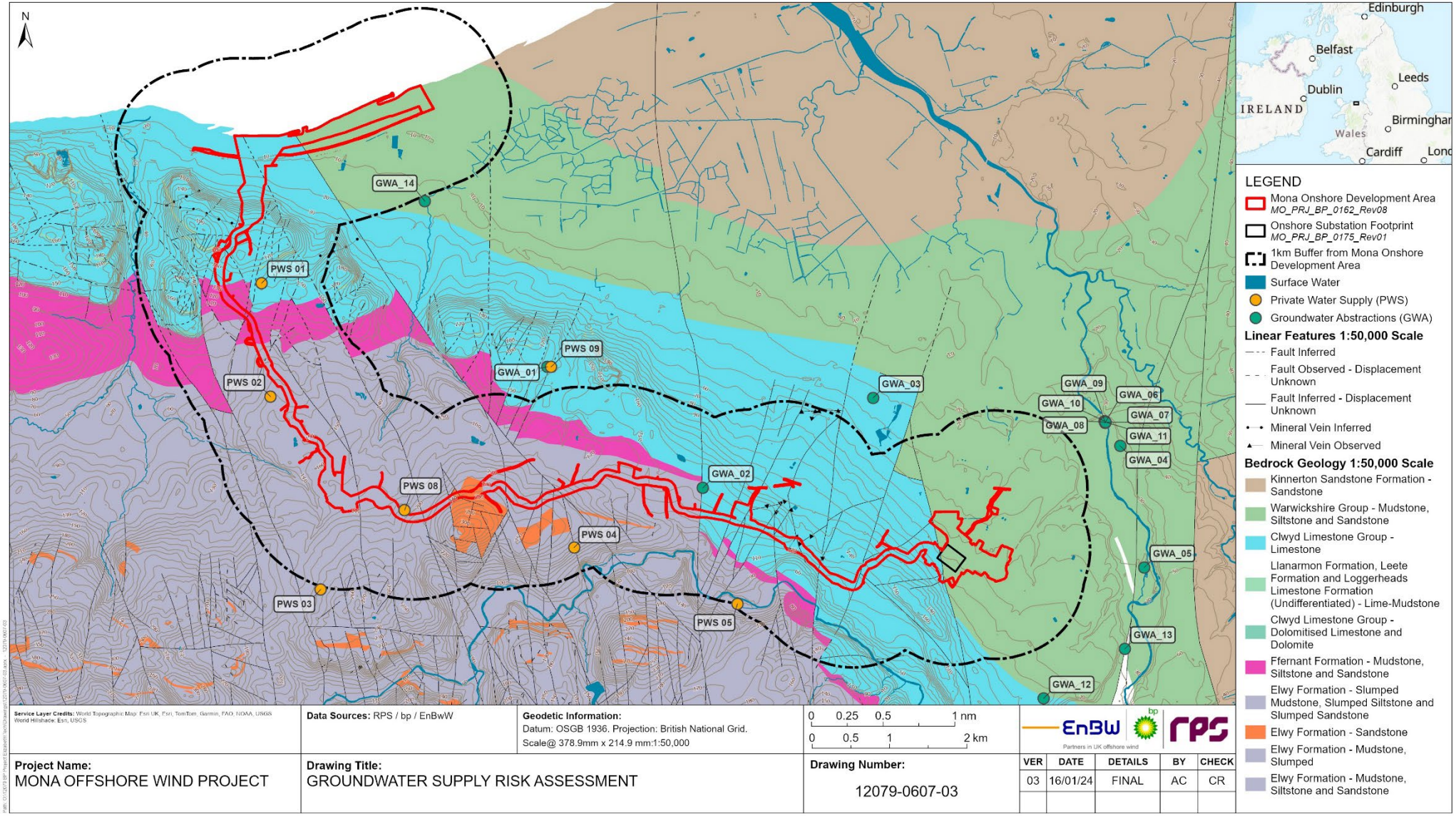

Figure 1.1: Location of licensed groundwater abstractions (GWA) and private groundwater supply sources (PWS) in the GHGC study area

1.3 Hydrogeological Risk Assessment

1.3.1 Approach

1.3.1.1 The risk to a licensed groundwater abstraction or a private groundwater supply source is determined on the basis of the probability that the hydrogeological pathway exists and the severity of the consequence (as a result of the construction activity) if the pathway exists. A qualitive risk ranking is assigned to each level of outcome using the risk matrix presented in Table 1.4.

Table 1.4: Qualitative risk matrix for licensed groundwater abstraction or private groundwater supply sources

QUALITATIVE RISK MATRIX		Severity of consequence if pathway exists			
		Severe	Moderate	Mild	Negligible
Probability that a hydrogeological pathway exists	Highly Likely	Very High Risk	High Risk	Moderate Risk	Low to Moderate Risk
	Likely	High Risk	Moderate Risk	Low to Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Low to Moderate Risk	Low Risk	No Risk
	Unlikely	Low to Moderate Risk	Low Risk	No Risk	No Risk

Probability that a hydrogeological pathway exists

1.3.1.2 The probability that a hydrogeological pathway exists is based on the following criteria:

- **Highly Likely** – The groundwater dependent supply source is known to be in same groundwater catchment and in a down hydraulic gradient position relative to the activity; and/or the groundwater flow path short; and/or the geological system is simple (e.g. shallow, sand and gravel aquifer in valley bottom); and/or the pathway proven in a more complex system
- **Likely** – The groundwater dependent supply source is expected to be in the same groundwater catchment and down-gradient to the construction activity; and/or it is a relatively simple geological/hydrogeological system/pathway; and/or it is a complex fractured system with known points of spring flow/discharge given position of source; and/or medium or short flow path.
- **Low Likelihood** – The groundwater dependent supply source is unlikely to be situated in same groundwater catchment or is in an up hydraulic gradient or lateral position to the activity; and/or the geological/hydrogeological system/pathway is complex and tortuous (e.g. thick multi-layered aquifer; low and high permeability beds interbedded; fracture pathways etc); and/or simple geological system but supply source is known to be up hydraulic gradient or lateral position; and/or long flow path.
- **Unlikely** – The groundwater dependent supply source is situated in a different groundwater catchment or up hydraulic gradient from construction activity; and/or pathway dominated by low permeability geological, units (mudstones / clays etc); and/or very long flow path.

Severity of consequence if a pathway exists

1.3.1.3 The severity of a potential consequence from an activity should a pathway exist shall is influenced by the following:

- Characteristics of the pathway in terms of:
  - pathway length and flow mechanisms
  - complexity / tortuosity of pathway and hydraulic continuity
  - potential for attenuation
  - the relative position of the supply source to the activity in the flow field
  - possible travel time
- Nature of the impact in terms of:
  - the magnitude/scale of the effect (e.g. on flow, levels or water quality)
  - the duration of the effect (permanent vs short term).

1.3.1.4 The severity of consequence is defined on the basis of the following criteria:

- **Severe** – A significant impact on the groundwater quality or quantity that could represent a risk to human health and/or the long-term viability of the supply source
- **Moderate** – A measurable impact on the groundwater quality or quantity, that could temporarily render the source usable or result in a long-term change in groundwater status although not its viability as source of supply
- **Mild** - A measurable change to the groundwater quality or quantity expected but no material change in status of the groundwater body or its viability as a source of supply
- **Negligible** – No measurable effect on the groundwater quality or quantity predicted expected at the source of supply.

Certainty

1.3.1.5 The assessment also considers certainty in terms of the probability the pathway exists and the severity of outcome. This will be defined either low, medium or high.

1.3.1.6 Given the importance of groundwater supply sources to their users and the fact the risk class defines the source protection measures, it is essential the assessment is conservative and precautionary in nature. If the uncertainty is medium or high, it will be necessary to raise the risk ranking by a level of two (e.g. from ‘Low Risk’ to ‘Low to Moderate Risk’ or ‘Moderate Risk’).

1.3.2 Results

1.3.2.1 A summary of the risk assessment for licenced groundwater abstractions and private groundwater supply sources is provided in Table 1.5. All private groundwater supply sources have been assessed. Only active licensed groundwater abstractions have been assessed.

Table 1.5: Summary of hydrogeological risk assessment for groundwater dependent supply sources within the GHGC study area.

Risk Assessment Reference	Source description	Horizontal separation (Source to the Mona Onshore Development Area at closest point)	Hydrogeology and potential pathway	Qualitative risk ranking					Justification / Note
				Pathway	*Confidence*	Consequence	*Confidence*	Risk class	
GWA 01	*SEE ASSESSMENT FOR PWS 09*								
GWA 06	Borehole into sandstones of the Warwickshire Group. Situated north of St Asaph and adjacent to the Afon Elwy	Source approximately 1.6 km northeast of the Mona Onshore Development Area.	These sources are located above the bedrock of the Warwickshire Group. These licensed groundwater abstractions are located a significant distance from the east end of the Onshore Cable Corridor and Onshore Substation. The abstractions are presumed to be down-hydraulic gradient from the Mona Onshore Development Area at significantly lower elevation and adjacent to the Afon Elwy which is the local receptor for groundwater flow	Unlikely	*High*	Negligible	*High*	No Risk	All active, licensed, groundwater abstractions are at very low risk of any impact resulting from the construction, of the Mona Offshore Wind Project, given: • They are located a significant distance (approximately 1.6 km) eastern end of Mona Onshore Development Area • They are situated in a presumed down-hydraulic gradient position from the Mona Onshore Development Area, at a lower elevation, adjacent to the Afon Elwy which represents the likely local groundwater receptor and hydraulic minimum. • The east end of the Mona Onshore Development Area is situated above glacial till, which is likely to be thick hence no effects on aquifer are possible.
GWA 07	Borehole into sandstones of the Warwickshire Group. Situated north of St Asaph and adjacent to the Afon Elwy	Source approximately 1.6 km northeast of the Mona Onshore Development Area		Unlikely	*High*	Negligible	*High*	No Risk	
PWS 01	Private Groundwater Supply Source. Type not specified but BGS borehole log indicates it is an 89 m deep borehole.	Source approximately. 370m northeast of the Mona Onshore Development Area	The abstraction borehole penetrates 89 m into the limestone aquifer of the CLG. Deep water strikes have been recorded at that borehole, which are assumed to represent enhanced fracture permeability at depth. Groundwater flow in CLG aquifer will follow those enhanced permeability pathways, generally to the northeast towards the low ground at Abergele, although locally towards the source due to pumping related drawdowns. Although the source is located at a topographically higher elevation, the saturated aquifer is lower than the Mona Onshore Development Area by more than 10 m. The Onshore Cable Corridor is underlain by till and mudstones/siltstones/sandstones of the Ffernant Formation (FF), which underlies the limestones of the CLG. The boundary with the CLG aquifer that the source draws from is faulted. The degree of continuity between groundwater in the faulted FF and the adjacent saturated CLG aquifer is uncertain - it is likely to be limited although it cannot be discounted entirely.	Low Likelihood	*Low*	Mild	*Low*	Low risk raised to **Low to Moderate** based on confidence	Hydraulic continuity between the FF Secondary A aquifer and the saturated Principal aquifer in the CLG cannot be discounted. As the groundwater level in the FF aquifer at the Mona Onshore Development Area is likely to be situated at a higher elevation than groundwater levels in the CLF at the source (i.e. up hydraulic gradient) the construction of the Onshore Cable Corridor does represent a potential risk, although it is small given the horizontal distance and complexity of the pathway. That risk is considered more likely to relate to water quality through accidental emission than impacts on levels or flow, given the small drawdown that would be caused by cable trench dewatering and its temporary nature.

PWS 02	Private Groundwater Supply Source. Type not specified.	Source approximately. 180 m southwest of the Mona Onshore Development Area.	The source is likely to be a spring or shallow well in the weathered EF or where there are fractured sandstone beds. Wells and springs are marked locally on Ordnance Survey mapping in this area. The Mona Onshore Development Area potentially crosses the groundwater catchment area for the source in an up gradient position which could possibly contribute to flow at the source. Groundwater flow is generally expected through fractures or intergranular in EF but flow direction likely to follow topography.	Low Likelihood	*Low*	Moderate	*Low*	Low to Moderate risk raised to **Moderate** or **High** based on confidence	The Onshore Cable Corridor does appear to cross the groundwater catchment area of the source, in an up-hydraulic gradient position. This means that construction activities could result in an impact on the PWS. Furthermore, the precise location of the PWS and its type is not currently known and it could be much closer to or even on the Onshore Cable Corridor. Given this high degree of uncertainty in the severity of consequence, the risk ranking has been raised to moderate or high. Further information regarding the location and type of supply source is recommended to enhance the risk assessment.
PWS 03	Groundwater catchment tank. Presumed spring fed.	Source approximately 1 km south-southwest of the Mona Onshore Development Area	A shallow groundwater catchment tank that intercepts shallow groundwater in the EF (either a shallow weathered horizon or spring flows from fractured sandstones). This will be shallow groundwater flow, to the northwest from Mynydd Bodrochwyn to the valley floor below. The Mona Onshore Development Area is located outside of groundwater catchment area of the source and at a significantly lower topographic elevation.	Unlikely	*High*	Negligible	*High*	**No Risk**	Given that the PWS is situated above the Mona Onshore Development Area, in a different groundwater catchment from the Mona Onshore Development Area and will be dependent on shallow groundwater flow from the high ground to the east we are confident there is no risk to this source.
PWS 04	Private groundwater supply source from a shared spring located within the land. No pump, gravity fed due to the springs elevated position. Water passes through settlement tank to a header tank. Reliable source that deals well with drought.	Source approximately 575 m south-southeast of the Mona Onshore Development Area	The groundwater supply source appears to be a shallow spring flow on the south-eastern flank of the local topographic high ground formed by EF that reaches 260 mAOD. General groundwater flow paths are expected to mirror topography (a shallow weathered system) or the extent of sandstones and local fracturing. The Mona Onshore Development Area is situated on the opposite side of the of the high ground, more than 575 m from the spring source although the Onshore Cable Corridor is located at a higher elevation than the source. The Mona Onshore Development Area is unlikely to be situated within the groundwater catchment area of the spring source unless it relates to a laterally continuous sand horizon.	Low Likelihood	*Medium*	Mild	*Medium*	**Low Risk**	The source is located at significant distance from the Mona Onshore Development Area on opposite side of this this high ground and likely to be outside of groundwater catchment. Lateral continuity between the source and the Onshore Cable Corridor is considered highly unlikely. There is a considerable distance of separation given the small and temporary nature of effects.
PWS 05	Spring Supply	Source approximately 1 km south of the Mona Onshore Development Area.	Spring fed property situated on valley floor within the EF down topographic gradient from Mona Onshore Development Area to the north. The Mona Onshore Development Area, however is situated on strata of the Clwyd limestone group dipping to the northeast which is likely to be a different groundwater catchment and entirely different aquifer unit.	Unlikely	*Medium*	Negligible	*Medium*	**No Risk**	The source is located on the EF; the; Mona Onshore Development Area is located on the Clwyd Limestone which dips to the northeast, On this basis, it is likely that they are in two different groundwater catchments. The point of supply almost 1 km away from the Mona Onshore Development Area. There is a considerable distance of separation given the small and temporary nature of effects.
PWS 06	Unknown. There is a private groundwater supply source running to the west of the land parcel. No further information provided.	Currently Unknown	Currently Unknown	-	-	-	-	High Risk	As the location of the groundwater supply source and tied property is currently unknown a high risk has been assumed until further data is obtained.
PWS 07	Source of supply from a 12ft deep well on the farm. Several wells along the field. Used for agricultural purposes. Used daily. Very reliable, there are two taps from the well which are constantly running.	Currently Unknown	Currently Unknown	-	-	-	-	High Risk	As the location of the groundwater supply source and tied property is currently unknown a high risk has been assumed until further data is obtained.

PWS 08	Shallow well on the property. Agricultural and residential use. Used daily and reliable. During times of heavy rainfall, the well needs washing out as there is runoff.	Approximately 35 m from the Mona Onshore Development Area	The groundwater supply source appears to be a shallow spring catchment tank on the northwestern flank of a local high ground (Moelfre Isaf) that is formed by the EF and rises to 317 mAOD. Groundwater flow paths in this shallow aquifer can be expected to reflect the local topography in the EF. The supply source is located in close proximity to the Mona Onshore Development Area and the Onshore Cable Corridor appears to cross the expected groundwater catchment area for the source.	Likely	*High*	Medium or Severe	*High*	**Moderate Risk to High Risk**	The Mona Onshore Development Area is situated approximately 35 m from the supply source and within its groundwater catchment area.
PWS 09	The private groundwater supply source to the property comes from a borehole (approximately 90 m deep) for the farm and milking. The supply source is used residential, agricultural, and business supply.	Source point taken as farmstead, 1.5 km north-northeast of the Onshore Cable Corridor.	The location of groundwater supply source point within land ownership boundary is not unknown. Given the source is a 90 m deep borehole it is assumed it abstracts from the CLG bedrock aquifer. Given the Mona Onshore Development Area is located at higher elevation, upon the EF on the opposite side of a valley there is no plausible groundwater pathway connecting the Onshore Cable Corridor and the borehole in the CLG.	Unlikely	*Medium*	Mild	*Medium*	**No Risk**	Although the location of the supply source within land parcel is not certain, there is no plausible hydrogeological pathway that can connect the source and the Onshore Cable Corridor.

1.4 Mitigation Measures

1.4.1.1 The level of mitigation or protection measures required for a groundwater dependent supply source is informed by the level of the risk summarised in Table 1.5. The following generic range of mitigation measures shall be applied:

- **Groundwater supply source at high risk**: Provision of permanent alternative source of supply (e.g. borehole or mains water connection) or site visit and additional hydrogeological characterisation to enable a more detailed assessment of risk (most notably where there is significant uncertainty in the outcome of the original risk assessment)
- **Groundwater supply source at moderate risk**: Monitoring during construction phase, with contingency measures in place should supply source be temporarily affected by the activity activities or site visit and additional hydrogeological characterisation to enable a more detailed assessment of risk (most notably where there is significant uncertainty in the outcome of the original risk assessment)
- **Groundwater supply source at low risk**: Temporary contingency measures in place should supply source be affected during construction phase
- **Groundwater supply source at negligible risk/no risk**: No mitigation measures required.

1.4.1.2 A summary of the proposed mitigation measures and/or further actions required for each of the groundwater dependent sources is provided in Table 1.6.

Table 1.6: Summary of hydrogeological risk assessment and proposed mitigation measures

RPS ID	Qualitative risk ranking	Recommended mitigations	Additional Notes
GWA 01	*See assessment for PWS 09*		
GWA 06	**No Risk**	No mitigation required	NA
GWA 07	**No Risk**	No mitigation required	NA
PWS 01	Low risk raised to **Low to Moderate** based on confidence	Monitoring during construction phase, with contingency measures in place should the supply source be affected during construction phase	Further consultation with supply source owner required
PWS 02	Low to Moderate risk raised to **Moderate or High Risk** based on confidence	Potential provision of alternative source of supply could be required or site visit and further hydrogeological characterisation to enable a more detailed assessment of risk.	The exact location and type of groundwater supply source is not known. However, the Onshore Cable Corridor is likely to cross catchment area for the groundwater source. Further consultation is required.
PWS 03	**No Risk**	No mitigation required	NA
PWS 04	**Low Risk**	Contingency measures in place should the supply source be affected during construction phase	NA
PWS 05	**No Risk**	No mitigation required	NA

RPS ID	Qualitative risk ranking	Recommended mitigations	Additional Notes
PWS 06	High Risk	Possible site visit and further hydrogeological characterisation to enable improved assessment of risk.	Further consultation with landowner required as location of the groundwater supply source and tied property is currently unknown.
PWS 07	High Risk	Possible site visit and further hydrogeological characterisation to enable improved assessment of risk.	Further consultation with landowner required as location of the groundwater supply source and tied property is currently unknown.
PWS 08	**Moderate Risk** or **High Risk**	Provision of an alternative source of supply or site visit and further hydrogeological characterisation to enable a more detailed assessment of the risk.	The Onshore Cable Corridor appears to be situated near to the supply source and crosses its groundwater catchment area.
PWS 09	**No Risk**	No mitigation required	NA

1.5 References

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