

# Annex M - Private Water Supply Risk Assessment

February 2023





**ARCUS**

**CROSSAIG NORTH SUBSTATION**

**ANNEX M  
PRIVATE WATER SUPPLY RISK ASSESSMENT**

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## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION AND BACKGROUND .....</b>	<b>1</b>
1.1	Overview .....	1
1.2	Project Description.....	1
1.3	Scope of Assessment.....	1
1.4	Drainage Impact Assessment.....	1
<b>2</b>	<b>PRIVATE WATER SUPPLY RISK ASSESSMENT .....</b>	<b>1</b>
2.1	Methodology.....	1
2.2	Consultation .....	2
2.3	Review of properties consulted.....	4
2.4	Site Visit .....	5
<b>3</b>	<b>RISK ASSESSMENT .....</b>	<b>6</b>
3.1	Introduction .....	6
3.2	Identification of PWS .....	7
3.3	Potential Hydrogeological connectivity .....	9
3.4	Impact Assessment .....	11
<b>4</b>	<b>PROVISION OF MEASURES TO MINIMISE THE IMPACT ON DRINKING WATER QUALITY DURING CONSTRUCTION .....</b>	<b>13</b>
<b>5</b>	<b>SUMMARY.....</b>	<b>13</b>



## **1 INTRODUCTION AND BACKGROUND**

### **1.1 Overview**

Arcus Consultancy Services Limited (Arcus), on behalf of SSEN, have produced this Private Water Supply Risk Assessment (PWSRA) which contains an assessment relating to properties with Private Water Supplies (PWS) within the area surrounding the proposed Crossaig North Substation (the Proposed Development) and proposed overhead line (OHL) tie-in works (the Associated Development). Together these are hereby known as 'the Project'.

The Project is located approximately 18 kilometres (km) south of Tarbert, immediately west of the B842, neighbouring the existing Crossaig Substation and within the Argyll and Bute Council (ABC) area. The location of the site is shown on Figure 6.1.

This risk assessment forms Annex M to the Crossaig North Substation Environmental Appraisal Chapter 6 Geology, Hydrology and Hydrogeology.

### **1.2 Project Description**

SSEN Transmission (the Applicant) proposes to construct a new 275 kV electricity substation in addition to the construction of a section of new OHL and two new towers (and four temporary towers) to connect the new substation to the existing Inveraray to Crossaig OHL (located at Grid Ref 182509, 650337). This upgrade is required to provide reinforcement to the existing network which will support the continued generation of renewable energy.

The new substation and accompanying infrastructure aspects of the Proposed Development will be subject to an application under the Town and Country Planning (Scotland) Act 1997, as amended, while the OHL and accompanying towers will be submitted for Section 37 consent under the Electricity Act 1989, as amended.

### **1.3 Scope of Assessment**

PWS within 2 km of the Project, are indicated on the Private Water Supply Study Area on Figure 6.1.

The Project will be accessed by an existing access track to the south, which is regularly used for operational activities with no upgrades (only maintenance) required (shown on Figure 6.1). The Environmental Appraisal confirms that effects relating to the use of the access track has been scoped out of the assessment. This risk assessment therefore does not cover supplies within 2 km of the access route.

### **1.4 Drainage Impact Assessment**

The Drainage Impact Assessment (Arcus 2023) provides information on the surface water drainage options for the Project. An estimated infiltration rate was calculated based on the subsoils from the BGS Bedrock geology data testing which determined the underlying geology to be of low permeability with drainage to be discharged to a nearby watercourse, in accordance with the SuDS hierarchy. The proposed SuDS scheme details an attenuation basin downslope of the site, with drainage discharged via a piped filter system with an outflow.

## **2 PRIVATE WATER SUPPLY RISK ASSESSMENT**

### **2.1 Methodology**

The Arcus methodology for this PWSRA has been developed historically in conjunction with SEPA and reviewed by several Scottish local authorities. This includes:



- Identification of PWS through consultation with ABC within 2 km of the Private Water Supply Study Area and review of other potential PWS identified using Ordnance Survey (OS) 1:25,000 raster mapping;
- Resident or property owner consultation via letter to those properties identified to be supplied by a PWS;
- A site walkover to verify location and type of PWS;
- Identify the source of water feeding the water supply and its catchment;
- Identify proposed infrastructure and construction activities within the catchment or in proximity to the water supply and its infrastructure (*e.g.* pipes) if required;
- Identify the potential effect on the water supply *i.e.* whether construction of the Project has the potential to change the quality and/or quantity of water at the receptor;
- Determine whether the PWS is at risk; and
- Outline mitigation techniques that will be implemented to minimise any potential impact of construction and operation on drinking water quality, if required.

Where conflicting information has been provided by the supply owner and local authority, information provided by the supply owner has been used.

### 2.1.1 Legislation and Guidance

The procedure for identifying and risk assessing PWS is based on the following legislation and guidance:

- The Water Quality (Scotland) Regulations 2010<sup>1</sup> (WQ Regulations);
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 ('the Regulations')<sup>2</sup>;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 - Guidance for Local Authorities (v4.0)<sup>3</sup>;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011<sup>4</sup>; and
- Scottish Environment protection Agency (SEPA) Land Use Planning System Guidance Note 31 2017 v3.0 (LUPS-GU31)<sup>5</sup>.

The PWSRA will assess the risk for all PWS which are located within the following categories outlined by SEPA LUPS-GU31 guidance:

- Groundwater abstractions within 100 m radius of all excavations less than 1 m in depth; and
- Groundwater abstractions within 250 m of all excavations deeper than 1 m.

## 2.2 Consultation

### 2.2.1 Identification of Private Water Supplies through Consultation

On 12<sup>th</sup> November 2021, a Freedom of information (FoI) request was submitted to ABC to acquire information on registered PWS located within a 2 km radius of the Project.

The FoI response from ABC provided data on all PWS located within the ABC area. The data was georeferenced by an Arcus Hydrologist using ArcGIS Pro to identify those located

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<sup>1</sup> The Water Quality (Scotland) Regulations 2010 [Online] Available at: <http://www.legislation.gov.uk/ssi/2010/95/contents/made> [Accessed 11/03/2022].

<sup>2</sup> UK Government (2017) The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. Available at: <http://www.legislation.gov.uk/ssi/2017/282/contents/made> [Accessed 11/03/2022].

<sup>3</sup> DWQR (2019) The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017: Guidance for Local Authorities Ver 4.0. Available at: <https://dwqr.scot/media/42030/the-water-intended-for-human-consumption-private-supplies-scotland-regulations-2017-guidance-v4-feb-2019-as-issued.pdf> [Accessed 11/03/2022].

<sup>4</sup> UK Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available at: <http://www.legislation.gov.uk/ssi/2011/209/contents/made> Accessed on: [Accessed 11/03/2022].

<sup>5</sup> SEPA (2017) Land Use Planning System (LUPS) SEPA Guidance Note 31 v3.0. Available at: <https://www.sepa.org.uk/library/content-search/?q=LUPS-GU31&LibGo=Search&page=1> [Accessed 11/03/2022].

within a 2 km buffer ('the Study Area') of the Project. This process identified 8 PWS to be located within the Study Area and are shown on Figure 6.5. The eight properties identified through this consultation are:

- Crossaig Lodge;
- North Cottage;
- Crossaig Substation;
- Cour Farm;
- Lower Crossaig;
- Ravensbay;
- Spearasaig; and
- South Crossaig.

Consultation with residents and landowners of the aforementioned properties with PWS was conducted on 10<sup>th</sup> December 2021. The consultation process was conducted by posting a letter and questionnaire to residents to obtain further information on the PWS supplying their property, as well as a corresponding map indicating the location of each PWS supply. The questionnaire and reasoning for each of the questions are outlined in Table 1.

**Table 1: Resident Consultation Questionnaire and Reasoning**

Question	Reasoning
<b>Type of supply (with list of options)</b>	Allows for identification of the likely PWS source water and provide an understanding of its potential connectivity to the Project and developing a source-pathway-receptor model. This allows for an initial level of sensitivity to be applied to the PWS source as part of the final risk assessment.
<b>Use of supply</b>	Aids in developing the source-pathway-receptor model and conceptual site model. Also to attribute sensitivity for the final risk assessment. Also provides information on the likely volumes of water abstracted at the PWS.
<b>Type of water treatment</b>	Understanding of the baseline vulnerability of the source and existing protection measures in place.
<b>Number of people supplied</b>	Provides information on the likely volumes of water abstracted at the PWS. Also helps to attribute sensitivity for the final risk assessment. It is acknowledged that this number can vary, particularly if the PWS supplies a commercial property.
<b>Number of livestock supplied</b>	Provides information on the likely volumes of water abstracted at the PWS. Also to attribute sensitivity for the final risk assessment. It is acknowledged that this number can vary seasonally.
<b>Volume of water abstracted (m<sup>3</sup>)</b>	Allows for initial assessment on the catchment or 'zone of influence' of the water supply. This is the likely area the supply is draining water from. This informs an understanding of the PWS potential connectivity to the Project.  For example, a large groundwater abstraction further from the Project may be hydrologically connected due to its larger zone of influence. A smaller abstraction, closer to the Project, may not be hydrologically connected because it has a very small zone of influence.  It is acknowledged that this is often unknown or estimated by residents.

Question	Reasoning
<b>Any comment of the condition of your water supply</b>	<p>This informs an understanding of the existing level of vulnerability of the PWS and potential need for additional protection measures.</p> <p>For example, PWS that have previously been influenced by quantity reductions during drought periods may be more vulnerable than those who have not experienced this.</p> <p>Any information regarding previous water quality issues or quantity issues can inform an understanding of where the water is likely to be sourced from and the pathway it takes to get to the property.</p>

### 2.3 Review of properties consulted

Table 2 below outlines the eight properties consulted by letter.

**Table 2: Properties with potential PWS within PWS Study Area**

Property	Grid Reference	Distance from Development	Supply present?	Comment on supply type and hydrological connectivity
Crossaig Lodge	183104 651196	260 m north-east and downslope of the Site (35 m AOD)	Yes (Shared supply) Surface watercourse Borehole present at Crossaig Lodge	Source of supply is situated downslope of the Project. Therefore, the PWS scoped into assessment.
South Crossaig	183102 650964	240 m north-east and downslope of Site (35 m AOD)		
North Cottage	181826 651099	270 m east and downslope of the Site Access track (35 m AOD)	Yes (Shared Supply)	The location of the source is unknown; storage tank is rainwater fed but supply pipe is disconnected from tank. PWS scoped into assessment.
Lower Crossaig	183079 651032	406 m north-east and downslope of Site (25 m AOD)		
Crossaig Substation	182771 650236	Located within Site boundary (80 m AOD)	Yes Rainwater fed source within the existing Crossaig Substation	PWS is situated inside the Site boundary and so is scoped into assessment.
Cour Farm	182342 648147	1.45 km south of the Substation Site (40 m AOD)	Yes Reservoir source	Information provided by the property resident shows the source of this PWS to be Loch nam Breac which is located upslope of all Development and therefore hydrologically disconnected. This PWS is therefore scoped out of further assessment.
Ravensbay	183342 652149	1.45 km north-east of the Site (30 m AOD)	Yes Source is a surface watercourse.	Information provided by the property resident shows the source of this PWS to be a surface water burn which is hydrologically

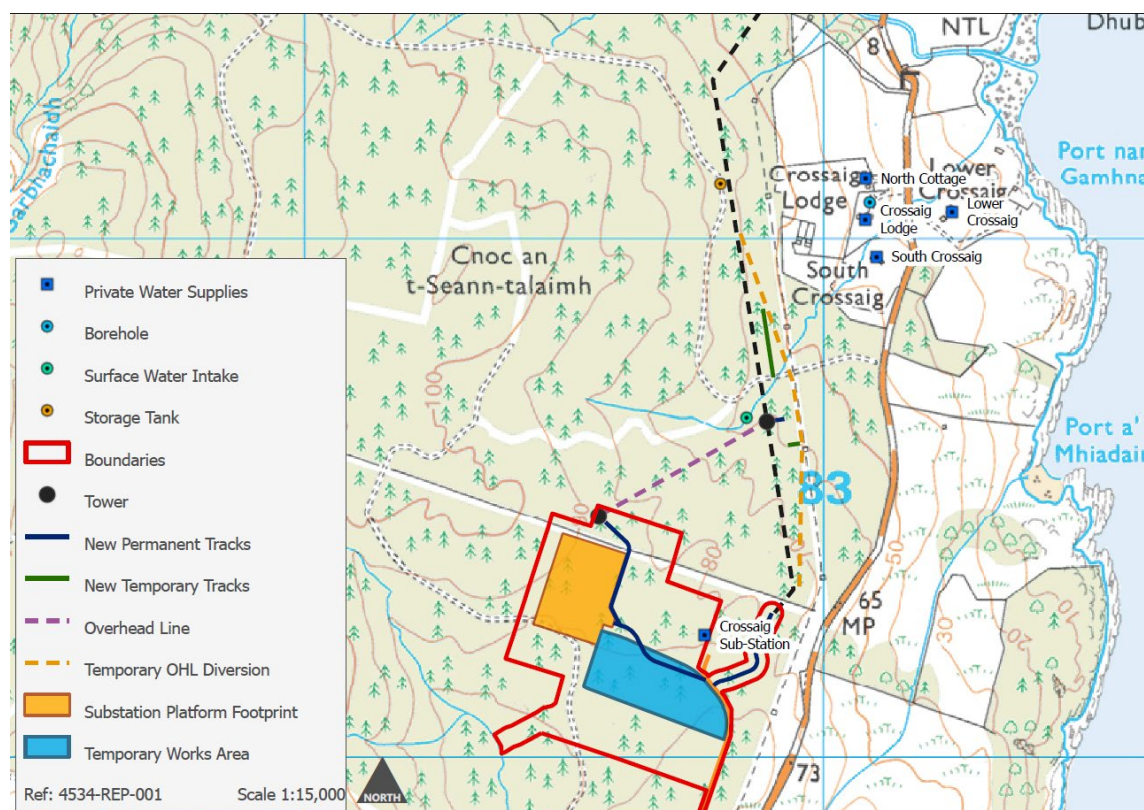
Property	Grid Reference	Distance from Development	Supply present?	Comment on supply type and hydrological connectivity
				disconnected from Development by Crossaig Burn. Therefore, this PWS can be scoped out of further assessment
Spearasaig	182351 648848	0.77 km south of the Substation Site (30 m AOD)	Unknown	This PWS is disconnected from the Site boundary by both topography and the Allt na Buaille Salaich. This PWS can be scoped out of further assessment.

Of these eight properties, Cour Farm, Ravensbay and Spearasaig are hydrologically disconnected from the Development and so will be scoped out of further assessment.

## 2.4 Site Visit

Following consultation with ABC and SSEN, a hydrological site walkover focusing on properties that may have potential hydrological connectivity to the Project was carried out on 14<sup>th</sup> March 2022 to verify the source locations for each supply. Five properties were identified (Crossaig Lodge, South Crossaig, North Cottage, Lower Crossaig and Crossaig Substation) as hydrologically connected to the Development. The location of these PWS can be seen in Plate 3.1.

**Plate 3.1. Location of private water supplies, sources and Project infrastructure.**



Information was collected from the residents in line with the requirements set out in Table 1 if a supply was present.

### 3 RISK ASSESSMENT

#### 3.1 Introduction

A PWSRA was undertaken in accordance with 'Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems' – whilst this guidance is primarily for windfarm developments, the principles outlined within assessment of impacts to new infrastructure projects can be used for reference<sup>6</sup>.

The risk assessment reviewed desk-based information associated with PWS, including geological maps, historical maps and surface water catchments. Where locations of the PWS water source are provided, this detail was overlain with mapped infrastructure associated with the Development to inform an initial source-pathway-receptor model.

Following the initial desk-based review, PWS and associated properties are identified as potentially 'at-risk' or 'not at-risk' from the Project. The level of risk is attributed to each of the PWS based on the sensitivity level of the receptor (source water, distribution infrastructure and point of supply), the criteria of which is outlined in Table 3, combined with the level of magnitude of change, for which the criteria is outline in Table 4.

The resultant level of risk is based on the risk matrix outlined in Table 5.

**Table 3. Estimating the Sensitivity of Receptors**

Sensitivity of Receptor	Definition
High	The hydrological receptor will support abstractions for public water supply, or private water abstractions which supply more than 25 people and / or 100 livestock (at any given point in the year) and/ or is used for the mass-production of food and drinks.
Medium	Hydrological receptor supports abstractions for PWS for limited agricultural use (at any given point in the year), or where mains water supply is available.
Low	The hydrological receptor does not support abstractions for public water supply or private water abstractions
Negligible	The receptor is resistant to change and is of little environmental value.

**Table 4. Magnitude of Potential Impacts**

Magnitude of Change	Description
High	A major permanent or long-term negative change to quality or available yield.
Medium	The yield of existing supplies may be reduced or quality slightly deteriorated.
Low	Any changes to quality, quantity or continuity do not result in a perceptible alteration to baseline conditions.
Negligible	No effect from Development to water quality, quantity or continuity on the basis of non-existent pathway in the 'source-pathway-receptor' model (this may be determined following avoidance and / or mitigation measures).

<sup>6</sup> SEPA (2014) *Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems* [Online]. Available at: [http://www.sepa.org.uk/media/143868/lupsgu31\\_planning\\_guidance\\_on\\_groundwater\\_abstractions.pdf](http://www.sepa.org.uk/media/143868/lupsgu31_planning_guidance_on_groundwater_abstractions.pdf) [Accessed 07/01/2022].

**Table 5: Risk Matrix**

<b>Magnitude of Effect</b>	<b>Sensitivity of Resource or Receptor</b>			
	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Negligible</b>
<b>High</b>	Major	Moderate	Moderate	Minor
<b>Medium</b>	Moderate	Moderate	Minor	Negligible
<b>Low</b>	Moderate	Minor	Negligible	Negligible
<b>Negligible</b>	Minor	Negligible	Negligible	Negligible

### 3.2 Identification of PWS

The details of the identified PWS and their hydrological connectivity to the Project are outlined in Table 6 below, based upon a desk-based risk assessment, letter and questionnaire (consultation) responses and the site walkover.



**Table 6: Confirmed Private Water Supplies**

<b>Grid Reference (of supply)</b>	<b>PWS Crossaig Lodge (Borehole)</b>	<b>PWS Crossaig Lodge (Surface Water)</b>	<b>PWS South Crossaig</b>	<b>PWS North Cottage</b>	<b>PWS Lower Crossaig</b>	<b>PWS Crossaig substation</b>
<b>Distance to Supply</b>	290 m north-east of temporary access track	35 m east of Project infrastructure		463 m north of Project infrastructure, immediately adjacent to access track potentially used for the Project. Unknown distance to source		Located within Site boundary
<b>Source of supply (type)</b>	Borehole	Surface water burn		Surface water/rainwater fed		Rainwater fed
<b>Use(s)</b>	Domestic/commercial	Domestic – Grey Water Use		Domestic		Domestic/ Industrial
<b>Bedrock Geology</b>	Beinn Bheula Schist Formation - gritty Psammite and Pelite					
<b>Superficial Deposits</b>	Superficial deposits not mapped			Devensian till – diamicton, raised marine deposits - sand and gravel	Superficial deposits not mapped	
<b>Hydrogeology</b>	Low productivity aquifer. Small amounts of groundwater in near surface weathered zone and secondary fractures.					
<b>Groundwater Classification</b>	Good					





### 3.3 Potential Hydrogeological connectivity

#### 3.3.1 Introduction

The sections below provide a review of potential hydrogeological connectivity between the Project and each supply. The conceptual site model (source, pathway, receptor) approach is outlined below:

- **Source** – pollutants or sediment from the site during construction or during operation phases (should drainage system fail);
- **Pathway** – as the Project includes a drainage system, any run-off would capture, treat and discharge run-off to the nearest watercourse in line with the Drainage Assessment. However, this assessment considers the construction phase and also if this would fail for any reason. Therefore, these pathways would consider the following:
  - Run-off via overland flow; and
  - Infiltration into the underlying superficial and bedrock aquifers.
- **Receptor** – each private water supply is considered as a receptor within this assessment.

#### 3.3.2 PWS Crossaig Lodge (Surface Water)

During the site visit conducted on the 14<sup>th</sup> March 2022, access was granted to the Crossaig Substation Site and the PWS source was inspected.

The existing source infrastructure was located 35 m east of proposed tower locations and 48 m south of the existing access track, although no exact intake location was confirmed. An open topped brick tank was observed which was previously connected with a metal pipe underground, but broken with no water entering the tank. It was assumed the pipe has previously collected water from the nearby watercourse. The water in the tank was stagnant with forestry branches and brash. A blue plastic pipe was exposed along the banks of the watercourse but it is not known whether this pipe is functional. Please refer to photographs in Plate 3.2.

A meeting was held with the residents of Crossaig Lodge and South Crossaig on the same day. Arcus personnel were informed that the PWS was no longer functioning due to ongoing construction works having damaged the PWS with the pipe assumed to be cut downslope of the source. At the time of this assessment, this supply was non-functional and supplied no water to residents. Therefore, it has been treated as a historical PWS and is no longer subject to potential effects from the Project.

**Plate 3.2 PWS source structures for PWS Crossaig Lodge and South Crossaig, NGR: NR 82848 50643 (Left: old weir intake pipe which is broken, right: debris covered weir tank with blue pipe disconnected from tank).**



### **3.3.3 PWS Crossaig Lodge (Borehole)**

The information provided by the consultation letter stated that the borehole for Crossaig Lodge was located on the grounds of the property. It was also stated that the depth of the borehole was 82 m. This borehole is located 290 m north-east of the new temporary access tracks. While this lies outside of the 250 m buffer of groundwater abstractions, the infrastructure lies immediately upslope of the borehole with no disconnecting features. Therefore, due to the distance between infrastructure and the groundwater abstraction, it is unlikely the borehole will be affected by the temporary access track however there is potential for hydrological connectivity.

### **3.3.4 PWS North Cottage**

The PWS source was inspected during the Site visit on 14<sup>th</sup> March 2022. The Storage tank for this PWS was located immediately adjacent to the existing access track north of the Site. It was found to be an open topped metal tank approximately 2 m in length, 1 m wide and 1 m deep. The tank itself contained a large volume of dark peaty water with significant forestry debris inside. A pipe was connected to the tank which was likely to allow water to flow via gravity to the properties downslope. It appears this had been recently replaced. This pipe continued downslope, through the culvert and into the previously felled area. West and upslope of the tank, a large tree stump had been overturned, potentially by forestry works. This appeared to have disconnected the pipe which supplied the tank with water. The exact source of the pipe is unclear Arcus personnel were unable to follow the pipe upslope due to falling trees creating an unsafe environment, however, it is thought the water source is upslope of the Project.

A meeting was held with the neighbours of North Cottage and Lower Crossaig who informed Arcus personnel that these two properties shared the same PWS and that the supply had been damaged and was no longer functional. It was also noted that the pipe upslope had previously been connected to the storage tank and the storage tank itself used to be at least partially embedded in the ground rather than above it. It is unknown whether this supply is no longer functioning due to previous project works or if the supply was already in a deteriorated state.

As this supply was damaged and no longer functional at this time of this assessment it will be treated as a historical PWS. Therefore, it is not subject to potential affects from this Project and cannot be impacted.

### ***3.3.5 PWS Crossaig Substation***

During the consultation stage with Environmental Health Office (EHO), the existing Crossaig Substation was shown as having a PWS. A consultation letter was sent to the property during the first and second round of consultation letters but no response was given. Information provided by SSEN confirmed the presence of a rainwater fed PWS. As this supply is rainwater fed from roofs, proximity to Project is not an issue and the Project will not impact the PWS.

## **3.4 Impact Assessment**

Following a review of the survey information and potential for supplies to be impacted, Table 7 provides a review of each supply and the potential risk to each. The assessment of impacts considers the embedded mitigation outlined within the Environmental Appraisal and WCEMP for the Development.



**Table 7: Properties with potential PWS within PWS Study Area**

<b>PWS</b>	<b>Sensitivity</b>	<b>Source-Pathway-Receptor link present?</b>	<b>Magnitude</b>	<b>Significance</b>	<b>Additional Mitigation?</b>	<b>Post mitigation significance</b>
Crossaig Lodge (Borehole)	High	Yes	Low	Minor	Monitoring of the supply will be implemented to ensure, quality, quantity and continuity	Negligible
Crossaig Lodge & South Crossaig (Surface water)	Negligible	Yes	Negligible	Negligible	None	Negligible
North Cottage & Lower Crossaig	Negligible	Yes	Negligible	Negligible	None	Negligible
Crossaig Substation	Low	No	Negligible	Negligible	None	Negligible



#### **4 PROVISION OF MEASURES TO MINIMISE THE IMPACT ON DRINKING WATER QUALITY DURING CONSTRUCTION**

The desk-based PWSRA has identified potentially sensitive drinking water receptors within 2 km of the Project, as the supplies at the four properties identified are hydrologically connected to the Project and have the potential to be impacted. Industry good practice measures will be implemented at the Project to protect the water environment and any additional drinking water supplies identified during the pre-construction phase.

If any additional supplies are identified in future, full details of water management measures and mitigation will be provided in a Construction and Environmental Management Plan (CEMP) for the Project.

#### **5 SUMMARY**

The PWSRA identified eight properties within 2 km which may have a PWS – eight identified by the ABC consultation process. However, three properties were scoped out of further assessment during the resident consultation stage of the PWSRA.

The PWSRA concludes that the surface water/rainwater fed PWS at Crossaig Lodge, South Crossaig, North Cottage and Lower Crossaig are not subject to potential effects from the Project as they are non-functional and therefore treated as historical PWS. However, it is concluded that the borehole PWS for Crossaig Lodge is hydrologically connected to the Project due to their location from the Project, intervening topography, hydrological features, or by existing transport infrastructure providing no hydrological barrier between the PWS and the Project.

On this basis, this PWSRA concludes one identified is hydrologically connected to the Project, and therefore the Project may result in impacts to the PWS water quality, quantity or continuity, on the basis of an existing pathway in the 'source-pathway-receptor' model.