SP TRANSMISSION

CPH APPENDIX 20

PRIVATE WATER SUPPLIES (PWS) RISK ASSESSMENT METHODOLOGY

Introduction

This process has been developed in line with the draft Strategy Session Planning Condition. This requires an Environmental Risk Assessment of the affects of development on the quantity and quality of water supplied to all properties through a Private Water Supply (PWS), as identified by each Stirling Council within 1km of the new line. SPT in conjunction with SHETL, separately from the statutory process, also thought it important to extend this risk assessment to properties not already known to Councils due to the potential risk to human health. They therefore undertook a further study (explained in stage 1 below) to identify additional properties that may be at risk.

Methodology

STAGE 1 – DESK STUDY

An initial desk based study to identify the location of properties with the potential to utilise a PWS was carried out.

Properties identified as having a PWS within 1km of the replacement transmission line by the Councils were identified in the ES and these properties have been included in the Stage 1 list of properties that could be affected.

To include properties with PWS's not known by each council, SPT/SHETL has undertaken a desk based screening process. This consisted of overlaying the route of the proposed line, towers and access tracks onto an Ordnance Survey base map. A buffer of 1km was then incorporated around the overhead line to identify a search zone. In addition to the search area defined by the draft Strategy Planning Condition, SPT/SHETL also assessed the risk from construction of access tracks. A 500m buffer around these tracks was incorporated where:

- Tracks extend between 500-1000m from the overhead line, and
- Tracks lie outwith the 1km buffer from the overhead line.

This search zone was assessed against the Scottish Water Supply distribution network to identify properties that are not likely to be served by the network. These properties were recorded and have been added to the list from the ES.

A search of SEPA records was also undertaken to ensure that all water abstractions authorised through the Water Environment (Controlled Activities)(Scotland) Regulations 2010 were taken into account. Those properties with abstractions authorised by SEPA have also been included on the list highlighting potentially affected properties.

STAGE 2 – INFORMATION VALIDATION

The list of potentially affected properties from Stage 1 have been used to inform a consultation process with the owners of each property. This has involved sending out letters to each property identified asking them to fill out a questionnaire with details of their PWS. This questionnaire saught information regarding location of source, distribution pipe work and properties supplied, quality and quantity of existing supply, what the supply is used for and any treatment provided prior to use.

This information has allowed an initial screening and risk assessment to identify properties that are unlikely to be affected (i.e. there is no pathway for any hazard to affect the supply) by the proposed development and do not require further site investigation. Properties that do have the potential to be affected have been categorised into risk type and whether a site investigation will be necessary in order to identify the required mitigation for the property's PWS.

STAGE 3 – FULL RISK ASSESSMENT AND PWS PLANS

A risk assessment will be undertaken for each site identified as having the potential to be affected.

Tier 1 of the process involves gathering the information from the returned questionnaires to use as a basis for a second screening and, where further information is required, site visits will be undertaken to inform the assessment.

Tier 2, the main risk assessment, will focus on confirming the receptors, identifying the vulnerability of those receptors and identifying the potential hazards associated with each PWS deemed to be at potential risk from the project works. These will then be combined to provide a 'severity of impact rating' on the receptors. The severity of impact rating combined with a proposed 'likelihood of occurrence' will determine the overall risk to the receptor from the project.

Once the full risk for each PWS has been assessed, site specific mitigation in the form of a PWS plan will be produced. These plans will include:

- Description of risks associated with the PWS site.
- a comprehensive account of all pre-construction sampling work that may be required to form a baseline for water quality.
- All upgrade works required to the distribution network and source prior to construction.
- Liaison required with PWS owner and relevant planning authority.
- All mitigation agreed to protect the PWS during construction (e.g. fencing off, pollution control measures, buffer distances etc.).
- Monitoring work required on-site for duration of works within the vicinity of the PWS.
- Contingency plans for predicted impacts (e.g. alternative source of water within 24hrs of an unforeseen incident).
- Final closedown inspection/sampling prior to leaving affected area.

The PWS plans will be distributed to the Planning Authority for written approval prior to commencement of construction works.

Risk Assessment Findings and Results

Summary of Risk Ratings

Risk Rating	Number of Properties
	Stirling Area
Very High	6
High	6
Moderate	2
Low	2
Very Low	58
Negligible (Tier 1 only)	9
TOTAL	83

Uncertainties

While every effort has been made to fully assess risks to PWS along the route of the transmission line a number of uncertainties remain within the risk assessment process which include:

- There is a potential that not all PWS have been detected along the route.
- Unless the owner of the property has provided detailed records it is unknown the exact location of pipework connecting the PWS to the property, particularly if the infrastructure is located underground.
- In some instances the actual abstraction pipework within surface water courses could not be identified. As such, it has been assumed that it will be abstracted at the point where nearby tanks and associated infrastructure were located.
- Not all private water supplies could be identified during the site visits, e.g. unable to access properties, land too overgrown and hence not safe to access. In these instances topographic maps, questionnaire responses, and any other communication with the site owners has been review to enable a best estimate as to where the supply may be located.
- Conditions have only been assessed at a particular point in time for each private water supply. It is noted that particularly for surface water courses that different conditions could be present depending on whether the stream is in high or low flow. A best estimate of the risks have been made.
- It has been assumed that the information supplied within the questionnaire by the property owner is correct, unless, confirmed otherwise during the site visits.
- Site visits have been completed by Gavia Environmental Limited within Scottish Power's section of the new line (see Annex A for detailed survey results). A summary is provided as follows:

- Fourteen private water supplies were identified within a 1km buffer of the Wharry Burn to Denny Transmission Line;
- Only one PWS (PWS1) has been assessed as being at **Major** potential risk;
- Six PWS assessed as being at **Minor** potential risk (PWS2, PWS3, PWS5, PWS8, PWS10 and PWS14);
- The remaining seven assessed as being at **Negligible** potential risk (PWS4, PWS6, PWS7, PWS9, PWS11, PWS12 and PWS13);
- PWS1 – identified as a high potential risk – will require appropriate mitigation in order to reduce this level of potential risk. This will most likely involve the protection of and avoidance of the associated PWS1 infrastructure (pipe and tank) during the construction phase;
- A site specific PWS Monitoring Plan should be implemented and it is recommended that all fourteen PWS's identified within a 1km buffer of the Wharry Burn to Denny Transmission Line should be monitored for quantity before during and after construction.

These uncertainties have been considered when developing control measures in order to safeguard private water supplies.

Standard Mitigation Measures

The protection of water courses and water bodies is of the utmost importance and irrespective of whether a private water supply is present or not, control measures will be implemented to protect the Water Environment during the construction works, as outlined within the Construction Procedures Handbook, Environmental Statement, Environmental Management Plans and associated guidance.

As part of the current risk assessment project, a list of standard control measures has been developed with regard to the protection of private water supplies. These controls are based upon the general principles of good construction practice and environmental protection (SEPA Pollution Prevention Guides – See Appendix 3) and have referred to the controls already developed as part of the main construction works, as outlined in the documents listed above, as a starting point.

The existing control measures have been assessed with regard to the range of potential impacts to private water supplies and supplemented in a few cases where it has been considered necessary to provide additional protection. In some instances the existing stand-offs or buffer distances have also been increased where a private water supply channel is present, to afford additional protection to drinking water supplies. In particular the buffer distances for water courses have been increased, as site inspections indicated that many of these channels, despite being relatively small, often provided the principal source for private water supplies.

It is considered that these measures will seek to prevent deterioration of private water supplies identified as a low to moderate risk. In addition these measures will seek to provide a safeguard to prevent significant deterioration of private water supplies that may not have been registered during the risk assessment process.

The standard controls have been tabulated and spilt into the following key work groups:

- General Controls / General Awareness.
- Material Storage & Maintenance.
- Construction Activities.

Within each work group an extensive list of construction activities has been prepared as a guide. This list is not exhaustive but is designed to cover the main activities.

Key potential impacts relevant to each activity have also been identified as follows, a colour coding system has been applied to assist with the identification process:

- Contamination – Groundwater.
- Contamination – Surface Water.
- Contaminant Leaching.
- Sedimentation – Surface Waters.
- Potential for Increased Run-off.
- Airborne Migration to Surface Waters.
- pH Change (Acid / Alkali).
- Damage to PWS Infrastructure.
- Bacteriological Impacts.

Advanced Control Measures

Where the standard controls are considered to be insufficient, additional precautionary measures have been developed. These measures have been referred to as advanced control measures and have generally been applied to moderate to high risk sites. The potential requirement for advanced control measures have been identified with regard to each PWS.

Where the potential for an advanced control has been identified, the construction activities within the vicinity of the PWS and associated infrastructure should be reviewed with regard to site specific conditions, and the advanced control measures applied if appropriate. It should also be noted that the contractor should maintain vigilance for changing conditions or the identification of previously unknown PWS supplies. In this instance there may be a requirement to upgrade selected PWS sites to the advanced control status. Where there is any doubt, professional advice will be sought.

The Advanced Controls are split into the following categories with an alphabetic key assigned to each control:

- Advanced Controls General.
- Advanced Controls, Storage & Construction.

The Advanced Controls are based on the following key principles:

- Increased Communication & Awareness.
- Inspection.
- PWS Infrastructure Protection (i.e. tanks, pipework and inlets).
- PWS Temporary Diversion.
- Damage Protection from Increased Sedimentation (i.e. use of silt fencing etc).
- Spill Prevention / Spill Response (provision of spill kits and training staff in their use).
- Water Quality Monitoring.

ANNEX A:

PRIVATE WATER SUPPLY SURVEY RESULTS

WHARRY BURN TO DENNY TRANSMISSION LINE PWS RISK ASSESSMENT

ISSUE DATE: NOVEMBER 2012

CLIENT: IBERDROLA

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Table of Contents

1. Introduction **1**
1.1 Scope of Work 1
1.2 Development 1
1.3 Disclaimer 1
2. Data Collection **3**
2.1 Desk Study 3
2.2 Site Survey 3
3. Data Collection Results **5**
4. Method **6**
4.1 Sensitivity 6
4.2 Magnitude of Effect 6
4.3 Potential Risk 7
5. Risk Assessment **8**
5.1 Identification of Construction Activities and Potential Effects 8
5.2 Sensitivity 8
5.3 Magnitude of Effect 9
5.4 Potential Risk 10
6. Indicative Contigency Plan **11**
7. Summary and Recomendations **13**
References **14**

Appendices

Appendix A: Additional Comments

1. INTRODUCTION

This report presents a risk assessment of the effects of the Wharry Burn to Denny 400Kv Overhead Transmission Line construction on private water supplies (PWS).

The field work and assessment within this report have been undertaken by CB Consulting.

1.1 SCOPE OF WORK

Key objectives of the assessment are:

- To undertake a desk study of data acquired from Scottish Water, Scottish and Southern Energy and Stirling Council;
- To undertake site visits to identify and determine the characteristics and risks of PWS;
- To identify all private water supplies within 1km of the development using information acquired from the desk study and site visits;
- To undertake a risk assessment of identified private water supplies and produce a risk assessment register; and
- To provide an indicative Contingency Plan in case of disruption or degradation of a private water supply.

1.2 DEVELOPMENT

The Wharry Burn to Denny Replacement Transmission Line Development will primarily consist of:

- The construction of a double circuit 400 kV overhead transmission line;
- Construction or upgrading of access tracks, public roads and working areas; and
- Removal of existing transmission line and related restoration work.

The development is part of the overall Beauly to Denny Replacement Transmission Line Development, which is a joint undertaking by Scottish Hydro-Electric Transmission Ltd (SHETL) and Scottish Power Transmission (SPT).

The Wharry Burn to Denny Replacement Transmission Line Development runs from Sheriff Muir south through a section of the Ochil Hills, crossing into the River Forth Valley where it finishes just south of Plean at the Denny substation . Land use in these areas is primarily farmland and moorland.

1.3 DISCLAIMER

The identification of private water supplies and interpretation of the ground conditions is based on the information obtained during site visits and from the desk study. All reasonable skill, care and diligence has been exercised in carrying out this report, within the timescales available. Notwithstanding the efforts made in carrying out this report, within the timescales available, it is possible that other soil and groundwater conditions and private water supplies, as yet undetected, may exist, and this must be taken into account in any reliance on the findings of this report.

This report is prepared for Iberdrola in relation to the Wharry Burn to Denny Transmission Line development, and takes into account the client's particular instructions and requirements. It is provided to the client subject to the terms of our appointment. Save to the extent we expressly agree in writing, it is not intended to be relied upon by any third party and no responsibility is undertaken to any third party.

2. DATA COLLECTION

2.1 DESK STUDY

A desk study was undertaken in order to determine all the properties which had the potential to utilise a PWS. The desk study pulled together information on PWS from the following sources:

- Stirling Council registered PWS information;
- Falkirk Council registered PWS information;
- The PWS database, as supplied to Stirling Council, as compiled by Scottish and Southern Energy for the Beauly to Denny 400kv Line Environmental Statement;
- Scottish Power Beauly to Denny 400kv Line Wayleave Contact Data (October 2012); and
- Scottish Water (SW) Supply Distribution Network maps - which were reviewed to identify any properties, within a 1.5km search area either side of the proposed transmission line, not shown on the maps as connected to the SW mains supply.

The desk study identified a total of 86 properties with the potential to utilise a PWS.

The full results of this desk study are given in the spreadsheet 'PWS properties - Master v5'.

2.2 SITE SURVEY

Site survey visits to properties with potential PWSs were undertaken by a suitably experienced hydrologist during October and November 2012.

The objectives of the site survey visits were to:

- Identify properties, within 1km of the development infrastructure, using PWS;
- Confirm properties, within 1km of the development infrastructure, using SW mains supply; and
- Collect information on properties with PWS within 1km of the development infrastructure.

Scheduled visit times were arranged at the properties for which contact details were available.

Questionnaires with self addressed envelopes were left at properties with no contact details or where homeowners were not at home during visits to answer questions. An example of the questionnaire is provided in Appendix 2.

The surveys collected the following information:

- Supply type (spring, well etc);
- Source and infrastructure locations (NGR);
- Hydrological characteristics within supply catchments;
- Treatment;

- Volumes abstracted;
- Historical quantity issues; and
- Supply quality.

Of the 86 potential PWSs identified through the desk study 61 were found to be connected to a SW mains water supply, and thus ruled out of the PWS risk assessment.

3. DATA COLLECTION RESULTS

In total, twenty-five properties were confirmed as utilising a PWS, of which three were utilised only for livestock.

Fourteen individual PWS's were identified as supplying the twenty-five properties. These results are given in Table 1.

Table 1: Private Water Supplies

PWS No.	Properties (Property No.)	Supply location (NGR)	Supply type
PWS1	Broomhill Cottage (1a) Carlie Craig Cottage (1b) Logie Cottage (1c) Longwood (1d)	NS 81718 97546	Spring
PWS2	Peindreich (2)	NS 80573 99125	Surface Water
PWS3	Craigton (3)	NS 81593 96192	Surface Water
PWS4	Newmills (4)	NS 82779 90888	Surface Water
PWS5	Parkhead (5a) Parkhead Cottage (5b) Cuil-na-sithe (5c) Drumbrae Farm (5d) Drumbrae Farm Bungalow (5e) Drumbrae Farm Cottage (5f)	NS 80725 97719	Well
PWS6	Cauldhame (6a) Glentyre Cottage (6b)	NN 82653 00840	Spring
PWS7	Sheriffmuir Inn (7a) Shirramuir House (7b)	NN 82640 01987	Spring
PWS8	The Linns (8)	NN 81515 01156	Borehole
PWS9	The Blair (9)	NS 82739 97052	Spring
PWS10	Shanraw Cottage (10)	NN 80779 03330	Surface Water
PWS11	Darnbogue Farm (11a) Carnock House (11b)	NS 86392 88533	Well
PWS12	Park Cottage (12)	NN 82921 01296	Surface Water
PWS13	Montana Cottage (13)	NS 82803 97022	Spring
PWS14	Steuarthall House (14)	NS 81500 93200	Private supply pipe connected to SW mains

4. METHOD

The assessment methodology is based on SNH guidance; a Handbook on Environmental Impact Assessment (2006), the methodology also draws on guidance from the Water Environment Sub-Objective from Transport Analysis Guidance published by the Department of Transport (2003) and the paper by Mustow *et al* (2005).

4.1 SENSITIVITY

On completion of the baseline data review the sensitivity of each private water supply, as defined in Table 2 has been assessed.

Table 2: Definitions of private water supply sensitivity

Sensitivity of PWS	Characteristics of PWS
Very High	Surface water abstractions within 0 – 200 m and groundwater spring abstractions from 0-100 m from construction activities; and Groundwater abstractions >1000 m^3/day (within zone of influence from development).
High	Large scale industrial agricultural abstractions 500-1000 m^3/day within 2 km downstream; Surface water abstractions for more than 15 people; Surface water abstractions within 200 m – 600 m, groundwater spring abstractions from 100 m – 400 m, and groundwater borehole abstractions from 0 – 200 m from construction activities; Groundwater abstractions 500-1000 m^3/day (within zone of influence from development); and Groundwater abstraction for PWS >10 m^3/day or serves >50 people.
Medium	Industrial/agricultural abstractions 50-499 m^3/day within 2 km downstream; Groundwater abstractions 50-499 m^3/day; and Surface water abstractions from 600m – >800 m, groundwater spring abstractions from 400 m – 800 m and groundwater borehole abstractions from 200 m – 600 m from construction.
Low	Industrial/agricultural abstractions <50 m^3/day within 2 km downstream; Groundwater abstractions <50 m^3/day; Private Water Supplies – groundwater spring abstraction >800 m; and Groundwater borehole abstractions from 600 - >800m from construction activities.

4.2 MAGNITUDE OF EFFECT

The magnitude of effect on each private water supply, as defined in Table 3, has been assessed.

Table 3: Magnitude of Effect

Magnitude	Criteria	Description
High	Results in loss of attribute	Fundamental (long term or permanent) changes to the quantity of water available for abstraction compared to predevelopment conditions Pollution of (long term or permanent) potable source of abstraction compared to predevelopment conditions
Medium	Results in effect on integrity of attribute or loss of part of attribute	Material but non-fundamental (medium term) changes to the quantity of water available for abstraction compared to predevelopment conditions Discharges to the receiving water, but insignificant enough to change its water quality status compared to predevelopment

		conditions
Minor	Results in minor effect on attribute	Detectable but non-material (temporary) changes to the water quality and water quantity compared to predevelopment conditions
Negligible	Results in an effect on the attribute but of insufficient magnitude to affect the use or integrity	No perceptible changes to the water quality and water quantity compared to predevelopment conditions No significant effect on the economic value of the receptor

4.3 POTENTIAL RISK

The potential risk to the PWS has been defined by taking into account the sensitivity of the PWS and the magnitude of the effect. Table 4 outlines how the sensitivity of the PWS and the magnitude of the impact define the potential risk.

Table 4: Potential Risk

Magnitude of Effects	**Sensitivity of PWS**			
	Very High	**High**	**Medium**	**Low**
High	Major	Major	Moderate	Minor
Medium	Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Potential risks are therefore concluded to be major, moderate, minor or negligible.

5. RISK ASSESSMENT

The potential effects of the development on the PWS were assessed through:

- Identification of construction activities and their potential effects;
- Assessment of the significance of impacts of the development, taking into account the sensitivity of the receiving environment and the potential magnitude (scale of duration) of the effect; and
- Assessment of the significance of risks from the development, taking into account the sensitivity of the receiving environment and the potential magnitude (scale of duration) of the effect.

Assessment of the magnitude of effect includes the timing, scale, size and duration of the potential effect.

5.1 IDENTIFICATION OF CONSTRUCTION ACTIVITIES AND POTENTIAL EFFECTS

The potential effects of the construction of the Wharry Burn to Denny transmission line on PWS have been identified in relation to potential effects on water quality and water quantity.

A summary of the potential effects of construction on the PWS source type is provided in Table 5 below.

Table 5: Potential Effects

PWS Source	Construction effects on quantity	Construction effects on quality
Surface water (burn)	Loss of PWS catchment contribution Changes to hydrological connectivity	Sediment contamination Chemical pollution
Shallow groundwater (spring)	Loss of PWS catchment contribution Changes to hydrological connectivity Changes to water table	Sediment contamination Chemical pollution
Bedrock aquifer (borehole)	Changes to water table	Sediment contamination Chemical pollution
PWS infrastructure (pipes, treatment & storage tanks)	Disruption or damage to PWS infrastructure	Sediment contamination Chemical pollution

5.2 SENSITIVITY

The sensitivity of the PWS's is detailed in Table 6 below.

The following conservative daily consumption figures have been assumed:

- Human consumption 250 litres/day; and
- Livestock consumption 110 litres/day.

Where no information was obtained on numbers of residents or livestock the following conservative estimates have been made:

- Residents – 6 people per house; and
- Livestock – 200 head of cattle per farm.

Table 6: PWS Sensitivity

PWS No.	Supply type	Estimated volume abstracted (m^3/day)	Distance of source from infrastructure (m)	Sensitivity of PWS
PWS1	Spring	People <10 Livestock <50	70	Very High
PWS2	Surface Water	Livestock <50	400	High
PWS3	Surface Water	Livestock <50	400	High
PWS4	Surface Water	Livestock <50	300	High
PWS5	Well	People >10 Livestock <50	550	Medium
PWS6	Spring	People <10	750	Medium
PWS7	Spring	People <10	550	Medium
PWS8	Borehole	People <10	500	Medium
PWS9	Spring	People <10	800	Low
PWS10	Surface Water	People <10	1600	Low
PWS11	Well	People <10 Livestock <50	1100	Low
PWS12	Surface Water	People <10 Livestock <50	950	Low
PWS13	Spring	People <10	900	Low
PWS14	Private pipe connection to SW mains	People <10	250	Low

5.3 MAGNITUDE OF EFFECT

The magnitude of effect on the PWS's is detailed in Table 7 below. The location of the PWS's in relation to the proposed development are shown in figures 1a-1c.

Indicative PWS catchments for surface waters and shallow groundwater springs have been inferred from topography. Catchments were interpolated using contour lines over digital GIS figures.

Table 7: Magnitude of Effect

Ref	Reason	Magnitude of Effect
PWS1	Potential loss of supply connection (quantity) - the access track crosses buried PWS pipe work and tank between towers TD201A –TD202A	High
PWS2	Potential changes to quality and quantity- surface water abstraction point on the Wharry Burn is down-gradient from development towers TD190B, TD191B, TD192C, TD192A/1A and TD193B and access track between towers TD190B and TD193B.	Minor
PSW3	Potential changes to quality and quantity – surface water abstraction point on the Logie Burn Catchment down-gradient from all development towers north of TD204A and access track north of TD204A.	Minor
PWS4	No potential changes to quantity or quality – surface water abstraction point up-gradient from development infrastructure	Negligible
PWS5	Potential changes to quantity and quality – well abstraction (at 5m depth) from dominantly fracture flow aquifer at an elevation of 155mAOD. Risk from developments towers TD199 (185mAOD) and TD200B (180mAOD) and the access track between TD199 and TD200B which are located up-gradient from the well.	Minor

PWS6	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment up-gradient from development infrastructure.	Negligible
PWS7	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment up-gradient from development infrastructure.	Negligible
PWS8	Potential changes to quantity and quality – borehole abstraction at a depth of 180mAOD (surface elevation of 210mAOD less 30m well depth) from a confined aquifer. Risk from towers TD191B (245mAOD) and TD192C (225mAOD) and access track between TD190B and TD192A/1A, which are located up-gradient from the borehole abstraction point.	Minor
PWS9	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment outwith zone of influence from development.	Negligible
PWS10	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment outwith zone of influence from Wharry Burn – Denny works.	Negligible
PWS11	No potential changes to quantity or quality – well abstraction from confined aquifer >1km from development infrastructure	Negligible
PWS12	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment up-gradient from development infrastructure	Negligible
PWS13	No potential changes to quantity or quality – shallow groundwater abstraction point and catchment outwith zone of influence from development.	Negligible
PWS14	Potential loss of supply connection (quantity) - the access track, between the A91 road and the development tower TD210B, crosses the buried PWS pipe work.	High

5.4 POTENTIAL RISK

The potential risk to each PWS is detailed in Table 8 below.

Table 8: Potential Risk

Ref	Sensitivity	Magnitude of Effect	Potential Risk
PWS1	Very High	High	**Major**
PWS2	High	Minor	**Minor**
PSW3	High	Minor	**Minor**
PWS4	High	Negligible	Negligible
PWS5	Medium	Minor	**Minor**
PWS6	Medium	Negligible	Negligible
PWS7	Medium	Negligible	Negligible
PWS8	Medium	Minor	**Minor**
PWS9	Low	Negligible	Negligible
PWS10	Low	Minor	**Minor**
PWS11	Low	Negligible	Negligible
PWS12	Low	Negligible	Negligible
PWS13	Low	Negligible	Negligible
PWS14	Low	High	**Minor**

Seven of the fourteen PWS, and associated infrastructure, were assessed to be at a potential risk, ranging from **Minor** to **Major**, from the works proposed for the Wharry to Denny Transmission Line.

6. INDICATIVE CONTIGENCY PLAN

In case of emergency (change in quality and/or quantity of supply) an alternate source of water shall be provided.

A detailed Contingency Plan shall be designed following the:

- Undertaking of a baseline data collection to identify quality and quantity of the identified PWS at potential risk; and
- Monitoring of the quantity and quality of PWS at potential risk over time.

Any identified short or long term detrimental changes to the quantity and/or quality of PWS shall trigger the contingency plan which shall include one of the options for quantity and quality issues detailed in Table 9 below.

Table 9: Options for quantity/quality issues

Options for quantity issues:	Options for quality issues:
Identify and assess alternate local PWS and connect	Identify and assess alternate local PWS and connect
Identify and assess additional local PWS and connect	Install appropriate water treatment/filters
Connect to SW mains	Replace and upgrade existing treatment
	Identify an alternate source of PWS and connect
	Connect to SW mains

A rapid response plan will ensure the rapid delivery of tankered water to those users potentially affected and maintain this PWS until problems are remedied. The core elements of the response plan include the following:

- Establish communication lines and protocols for initiating emergency response;
- Create a plan for immediate distribution of potable water (bottled);
- Create a plan for medium to long term alternative supply (bowser /tanker);
- Develop a protocol for assessing the source of contamination. Consider interactions with intermediary landowners and potential for contamination source to be related to these rather than the development;
- Plan for immediate water quality analysis (have sealed inert sample bottles on site along with a sampling protocol and plan for remittance to a suitable lab);
- Develop a risk management strategy incorporating the following:
    - Establish access to suitable specialist advice regarding possible effects if contaminated water is imbibed;
    - Develop a plan for assessment of contamination duration and obtaining specialist advice on mitigation; and
    - Develop a protocol for re-sampling to establish when the PWS is restored to its former state.
- Write to private water supply users detailing the proposed rapid response plan and a hotline number they can call in the event of contamination;

- Produce business card style hotline card that can be carried or kept in a handy location; and
- Consider sending out periodical communications outlining development phases to PWS users so they are aware of what is happening.

The long term contingency, in case of long term deterioration of quality or quantity, would be to arrange for and fund an alternative source, should the stated options be unsatisfactory to the PWS user, SEPA or the Local Council. This would most likely be an alternative PWS as close to the original as possible where quality and quantity were at least as good as the original, as determined from the baseline survey undertaken as part of a Water Quality Monitoring Plan.

With the application of appropriate mitigation measures the likelihood of any PWS being adversely impacted in the short or long term is considered low.

7. SUMMARY AND RECOMENDATIONS

Fourteen private water supplies were identified within a 1km buffer of the Wharry Burn to Denny Transmission Line.

Only one PWS (PWS1) has been assessed as being at **Major** potential risk.

Six PWS have been assessed as being at **Minor** potential risk (PWS2, PWS3, PWS5, PWS8, PWS10 and PWS14).

The remaining seven identified PWS have been assessed as being at **Negligible** potential risk (PWS4, PWS6, PWS7, PWS9, PWS11, PWS12 and PWS13).

The PWS identified as being at a high potential risk (PWS1) will require appropriate mitigation in order to reduce this level of potential risk. This will most likely involve the protection of and avoidance of the associated PWS1 infrastructure (pipe and tank) during the construction phase.

A site specific PWS Monitoring Plan should be implemented and it is recommended that all fourteen PWS's identified within a 1km buffer of the Wharry Burn to Denny Transmission Line should be monitored for quantity and quality before, during and after construction.

REFERENCES

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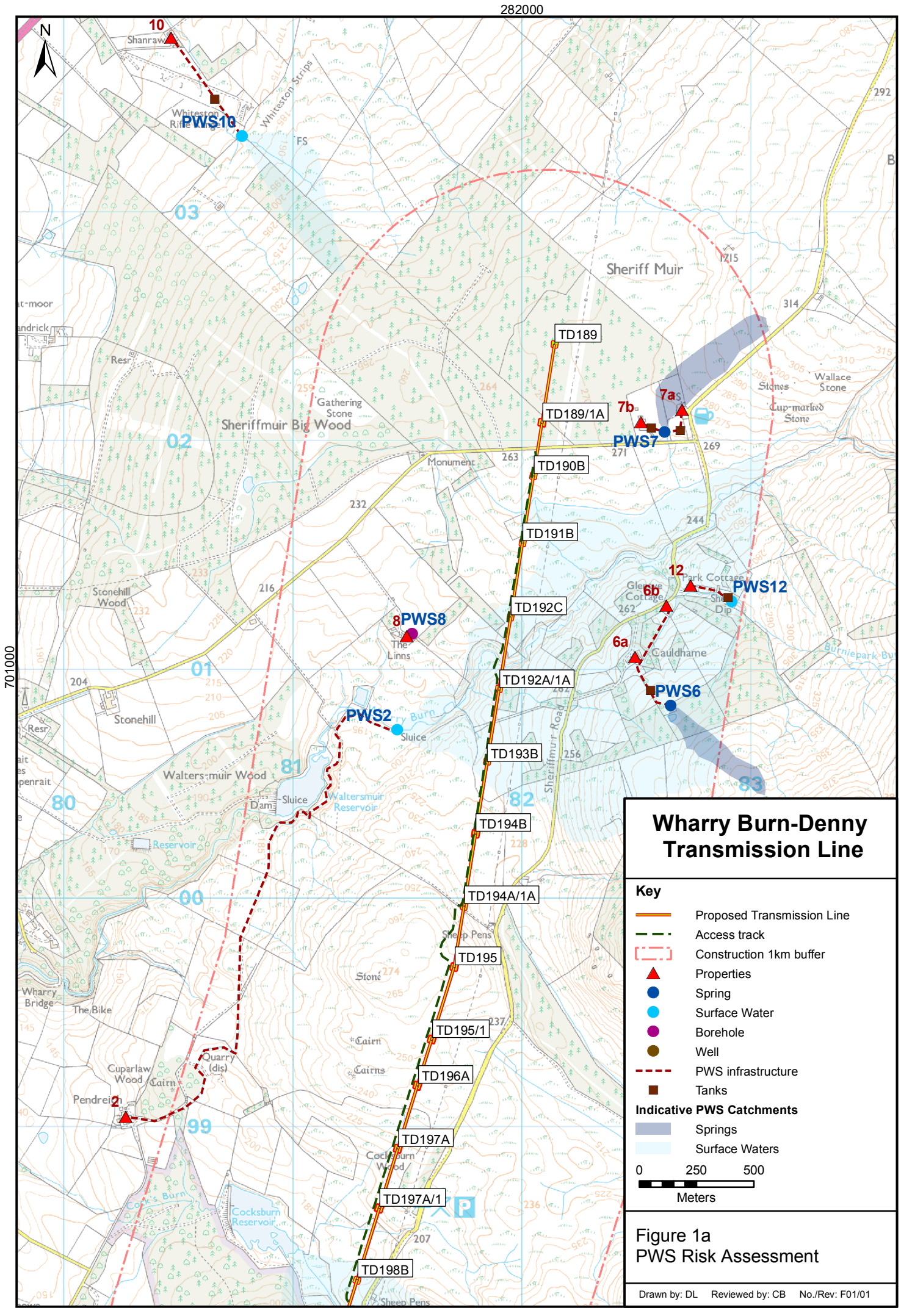
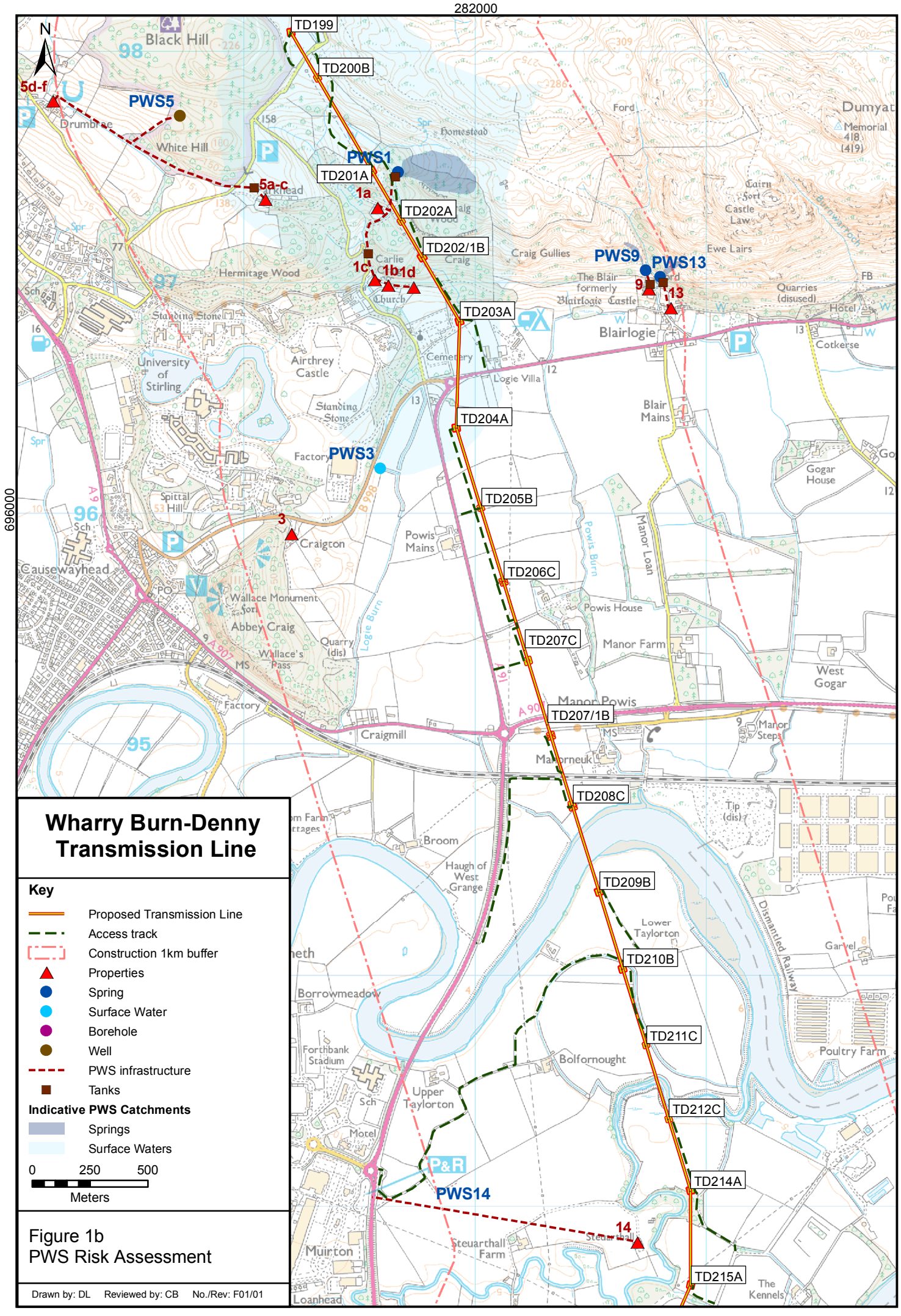
Appendix A: Additional Comments

Ref	Comments
PWS1	The catchment to this supply is up-gradient from the proposed construction activities, and as such the quality of this supply is not considered to be at risk. However the proposed access track will cross the pipework of this PWS at NS 81655 97378. The quantity of this supply is therefore considered to be at risk.
PWS2 PWS3	The proposed development infrastructure is located up-gradient and within the catchments to these supplies, which abstract directly from burns. The quality of these supplies is therefore considered to be at risk. However, it is noted that these are open watercourses utilised only for livestock, and as such the effect is not considered to be significant.
PWS5	The well at PWS5 abstracts at depth of 4.5m, most likely from the Ochil Volcanic Formation. The Ochil Volcanic Formation forms an igneous bedrock aquifer where fracture flow would be dominant and productivity would be low. Glacial till is known to occur at the point of abstraction; however this layer is intermittent in the surrounding area, as indicated by the BGS Geology of Britain Viewer. The vulnerability of groundwater in this area is classified as 5 – the highest level of vulnerability. The topography indicates the catchment for this supply is probably away from construction activities; however a certain level of uncertainty arises from fracture flow mechanisms. As the proposed construction activities are located up-gradient from the PWS and the nature of the groundwater suggests high vulnerability to those pollutants not readily adsorbed or transformed, the quantity and quality of this supply is considered to be at risk.
PWS6 PWS7 PWS9 PWS12 PWS13	The catchments for these supplies, which abstract from shallow groundwater springs and surface waters, are located up-gradient form the proposed development and infrastructure. No PWS infrastructure was identified which could be affected by the construction activities. The quality and quantity of these supplies is not considered to be risk.
PWS8	The depth of the borehole at PWS3 is approx. 30m and this source abstracts from the Sheriffmuir Sandstone Member – a sandstone aquifer. This aquifer is thought to be of moderate productivity with predominantly intergranular fracture flow (SEPA 2004). The aquifer is overlain by boulder clay and is therefore confined, as indicated by BGS Sheet 39E Drift Edition (Alloa). The groundwater vulnerability in this area is classified as 4d/4c which indicate a moderate vulnerability to those contaminants not readily adsorbed or transformed. The quality and quantity of this supply is considered to be at risk. This property has an additional secondary supply from a lade to the north (NN81420 01312) which is used if the primary supply runs dry. This supply could potentially be used if the primary supply is affected by the construction activities, although it also is at risk from quality and quantity issues relating to development towers and access tracks north of TD191B.
PWS10	The proposed development infrastructure is located up-gradient but not within the catchments to this supply, which abstracts directly from a burn. The quality of this supply is therefore considered to be at risk.
PWS11	The owners/residents of these two properties (11a and 11b) have either been unreachable or have no knowledge of the PWS although it has been confirmed. The location of a well has been assumed based on information from a local farmer. This location is out with the 1km development buffer however due to the uncertainties involved the supply has been assessed. This well is likely to abstract from the Passage Sandstone formation, which has a high productivity rating with dominantly intergranular flow. The groundwater vulnerability of the formation in this area is classified as 2 which suggests a low vulnerability to those pollutants not readily adsorbed or transformed. Infrastructure which is located up-gradient from the supply is underlain by boulder clay, as indicated by BGS Sheet 39E Drift Edition (Alloa). Due to the distance from the proposed development and the presence of boulder clay, the quantity and quality of this supply is not considered to be at risk.
PWS14	The proposed access track could affect the private pipework and as such the quantity of this supply is considered to be at risk.
PWS4	This property consisted of only sheds, the owner has not been identified and as such no contact details have been obtained. Based on the information from the SSE PWS database, we have assumed a surface water abstraction from a burn running beside the property for agricultural and livestock uses. The catchments for this supply, is located up-gradient form the proposed development and infrastructure. The quality and quantity of these supplies is not considered to be risk.


282000
701000
N
10
Shanraw
PWS10
Whitestone Rifle Range
Whitestone Strips
FS
03
Sheriff Muir
1715
292
314
TD189
TD189/1A
7a
7b
PWS7
271
269
Wallace Stone
Stones
Cup-marked Stone
Gathering Stone
Sheriffmuir Big Wood
02
Monument
263
TD190B
232
244
TD191B
12
PWS12
Park Cottage
6b
Glenvale Cottage
262
TD192C
8
PWS8
The Linns
6a
Cauldhame
Stonehill Wood
216
01
204
Stonehill
TD192A/1A
PWS6
PWS2
Sluice
Burn
961
TD193B
256
Sheriffmuir Road
Walters-muir Wood
81
82
83
80
Dam
Sluice
Waltersmuir Reservoir
TD194B
Reservoir
00
TD194A/1A
Sheep Pens
TD195
Stone
274
265
Wharry Bridge
The Bike
TD195/1
237
Cairn
Quarry (dis)
Cairns
TD196A
Cuparlaw Wood
Cairn
Pendreich
2
99
TD197A
Cocksburn Wood
Cocksburn Burn
Cocksburn Reservoir
TD197A/1
236
207
TD198B
Sheep Pens
Wharry Burn-Denny Transmission Line
Key
Proposed Transmission Line
Access track
Construction 1km buffer
Properties
Spring
Surface Water
Borehole
Well
PWS infrastructure
Tanks
Indicative PWS Catchments
Springs
Surface Waters
0
250
500
Meters
Figure 1a
PWS Risk Assessment
Drawn by: DL
Reviewed by: CB
No./Rev: F01/01



Wharry Burn-Denny Transmission Line

Key

- Proposed Transmission Line
- Access track
- Construction 1km buffer
- Properties
- Spring
- Surface Water
- Borehole
- Well
- PWS infrastructure
- Tanks

Indicative PWS Catchments

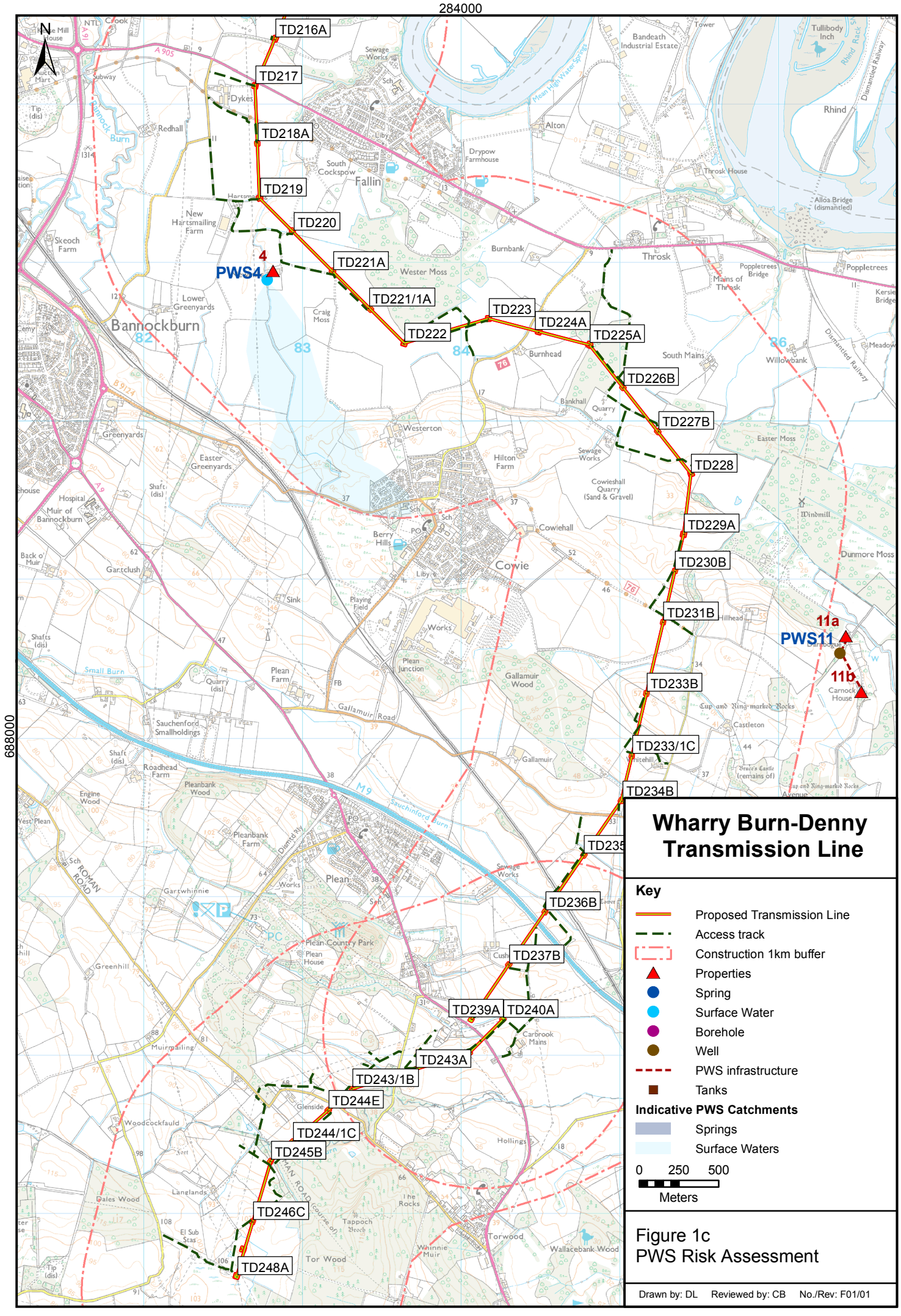
- Springs
- Surface Waters

0 250 500

Meters

Figure 1b
PWS Risk Assessment

Drawn by: DL Reviewed by: CB No./Rev: F01/01



Wharry Burn-Denny Transmission Line

Figure 1c
PWS Risk Assessment

Drawn by: DL Reviewed by: CB No./Rev: F01/01