ELECTRICITY ACT 1989

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997

The DPEA Code of Practice for s. 36 Inquiries

CLOSING SUBMISSION

for DR RACHEL CONNOR AND MR TIM HARRISON (the Connor/Harrison Group or CHG)

Third Party Objectors

in the public examination of an application for consent under the Electricity Act, s.36 for the Third Extension to the Whitelee Windfarm.

PROPOSED THIRD EXTENSION OF WHITELEE WIND FARM BY THE ADDITION OF FIVE WIND TURBINE GENERATORS IMMEDIATELY NW OF THE EXISTING WHITELEE WINDFARM, SOUTH OF THE B 764 ROAD.

The DPEA reference is WIN-190-1

The Examination is being conducted by *Ms Frances McChlery BA LARTPI and Mr Dannie Onn BSc Dip Arch, RIAS IHBC*, both DPEA Reporters.

Contents

1 Parties

This is an application by SPR for the addition of 5 turbines to the Whitelee complex of wind turbine generators. The WLWF site has thus far progressed in three stages; the original windfarm, and two extensions, here referred to as WLWF, WL 1 and WL2. This application is known as Whitelee Third Extension, or (here) WL3.

The Local Planning Authority, East Ayrshire Council (EAC) and the CHG have taken part in the Examination process. The Moscow and Waterside and Fenwick Community Councils have made written contributions.

The application is for consent to construct a "generating station" with an installed capacity in excess of 50MW (Electricity Act 1989, s. 36) (here, EA 1989)

This submission is made on behalf of the CHG, previously the Protect Our Water Group) (POW) which is a Third Party Group that has participated in the application and Examination process throughout. It has consistently objected to the proposal, and advanced reasons for its objections which have remained consistent.

2 Interests of third parties.

Mr and Mrs Tim Harrison reside at Cauldstanes, less than 1 km from the Easterly margin of the proposed Whitelee Extension 3 site (WL3).
They already experience considerable visual impact and noise from the existing Whitelee Windfarm (WLWF) which has been operational since 2009. During 2007, during peak earthworks and construction activity on the WLWF site, in combination with neighbours at Kingswell and Best Friends (Veyatie), Cauldstanes lost their domestic water supplies completely, from what had been a previously reliable spring water source.
This water source, shared with Best Friends and Kingswell had never been charted by Scottish Power Renewables (SPR) or their agents, for either of the previous Environmental Statements (ES) or for private water supply (PWS) risk assessments for WLWF in 2003 or 2006, or for the WL1 and WL2 Extensions in 2010.

This PWS was not monitored by SPR for WLWF, having been designated 'low risk', despite the collecting tank being within 1300m of the nearest construction excavation (turbine 3).
Complete loss of their domestic water meant that Mr and Mrs Harrison, as well as householders at Best Friends, were required to install boreholes and suitable treatment facilities at their own, considerable expense to reinstate a water supply.
During the Public Inquiry, Mr Innes , for SPR, criticised Mr Harrison in cross examination for installing this borehole into groundwater(GW), adjacent to his property and 'downhill' within the hydrological gradient, from the ongoing WLWF construction activity in 2007-2008, when Mr Harrison should have been aware that the GW had become contaminated as a result of windfarm construction.
Mr Harrison, does not own any other land in proximity to Cauldstanes and had been left with no alternative but to install a borehole adjacent to his house, unknowingly extracting the GW which had been contaminated by SPR's construction activities.
The same would have been true of Best Friends, which owns land only adjacent to the property, and where a shallower borehole than at Cauldstanes extends into vulnerable alluvium adjacent to Kingswell burn.

After losing his water supplies completely for 3 months early in 2007, Mr Elliot Davis, at Kingswell, had spontaneous resumption of the original spring water flow, but with noticeable deterioration in quality, with high turbidity and mineral content **(SPRWO20 Table 1**), which was above regulatory limits as defined in the Private Water Supplies (Scotland) Regulations 2006 **(SPR-WO09 Part V)**.These quality changes persisted until at least 2014.
The nearest residential receptors of Cauldstanes, Kingswell and Best Friends properties are at unacceptable risk from WL3 for further disruption of quantity or quality of PWS, together with overwhelming visual impact and overwhelming cumulative windfarm noise.

Dr Rachel Connor lives to the South of the proposed WL3 site and immediately adjacent to the 140 metre turbines of the WLWF Extension.

Her family, along with 11 other households, already experience overwhelming visual impact from the proximity of the 140 metre turbines of Whitelee Windfarm Extension (WL WFX). Many of these households suffer intrusive wind turbine noise which is currently the subject of investigation as a statutory noise nuisance by East Ayrshire Council (EAC).

During the construction period of both WLWF and WLWF1 and 21, the large Airtnoch PWS supplying Dr Connor and 9 other households, which had been designated as being at 'medium' risk for contamination(Atkins 2010 PWS risk assessment. (**CH 032 3.2 Table 5**), experienced dangerous levels of bacterial contamination as well as peaks of turbidity.

Dr Connor became concerned that the effects of preceding WF developments had affected not only multiple PWS surrounding the Whitelee site, but also raw water feeding into two public service reservoirs also dependent on the Whitelee site and that this had adversely impacted on the quality of distributed potable water. (**CH 149 Ch.2 p18**)

Although WL3 Extension may not directly affect the still unknown, uncharted Airtnoch water source, by virtue of being a distant hydrogeological catchment area from WL3, or directly affect the public water reservoirs, (unless this is by virtue of contribution to contamination of GW on the whole Whitelee site), Dr Connor remains concerned as a member of the public and in her role as a local Community Councillor, about the potential impacts of WL3 particularly, but not exclusively, upon drinking water supplies.

She remains concerned that the 'best practice' mitigation previously employed on the WLWF sites was unsuccessful in preventing contamination of surface and groundwaters and that adoption of similar practices for WL3 will again prove to be inadequate.

3 Regulators

Although the CHG has advanced certain criticism of Scottish Water (SW), the Scottish Environmental Protection Agency (SEPA), the Drinking Water Quality Regulator (DWQR) and the Local Authority, East Ayrshire Council (EAC), it recognizes that this is not an inquiry about water regulation. But it is the failure of regulation which has spurred the CHG evidence, leading necessarily to the conclusion that consent should be refused.

4 Submission

This application should be refused, since it cannot be said that the criteria in Schedule 9 EA 1989 have been fulfilled, and because the proposed development is contrary to the EAC Development Plan. In particular, in that regard, it has been demonstrated on a balance of probabilities that the proposal is likely to harm the water supplies of Kingswell, Cauldstanes, and Best Friends, (otherwise Veyatie). These are unacceptable consequences of development, and accordingly this proposal should not receive consent.

5 Site and the Whitelee proposals

The site and the proposals are described in the ES for the WL3 project. The site has been inspected on both accompanied and unaccompanied site inspections by the Reporters. The important feature to recognise is its generally sloping topography and the relative distances from proposed turbine locations to affected residences. The Reporters will kindly please have regard to the effect and impact of the existing Whitelee turbines on affected private residences.

6 The WL3 windfarm site

6.1 Drinking Water Protected Area

The entire WL3 windfarm site, comprising 5 x 111m high turbines, a quarry, a storage and construction compound, is sited within a statutory, designated surface and groundwater drinking water protected area (DWPA) Fig 1. (from CH 154) and Fig 2 (below).Twenty eight of SPR's turbines are 'hosted' on Scottish Water's(SW) public water catchment area for WLWF and 32 larger turbines, are hosted as part of the WL WF Extensions 1 and 2. All 60 of these SPR turbines are sited on a designated surface and groundwater DWPA.
The entire existing Whitelee windfarm site, comprising 215 turbines, is sited on a designated protected groundwater DWPA.

6.2 Considerations of Site Layout

The WL3 consent will include the demolition of Moor Farm and its steadings.
East Ayrshire Council consider that the water supply and source to Kingswell collection tank may be in close proximity to Moor Farm.
As the water source to Kingswell remains unknown and has never been charted for either WL3 or any of the previous WL windfarms, the destruction of Moor Farm may jeopardise either the water source or the supply pipe.
The WL3 proposal brings major industrial activity in the form of forestry clearance, major construction earthworks, blasting and excavation associated with quarrying and the demolition of Moor Steading within 500 m of the Kingswell water collection tank.

The construction compounds, quarries and turbine foundations all lie closer to adjacent PWS than occurred for the preceding turbines of WLWF and will provide additional, ongoing risks to PWS which were affected during previous windfarm developments.

6.3 Mapping of Private Water Supplies

The developer, SPR, is required under the Åarhus Convention to provide contemporaneous and accurate information for an Environmental Statement (ES), to inform the public, the competent and statutory authorities and enable an informed planning decision to be made.

In *Figure 1* from Figure 9.3 WL3 ES, relevant Private water supplies are charted by Jacobs Ltd near the proposed WL3 development site. This map should allow competent and statutory authorities to determine whether in combination with geohydrological information, separation distances from construction and excavation are likely to be adequate.

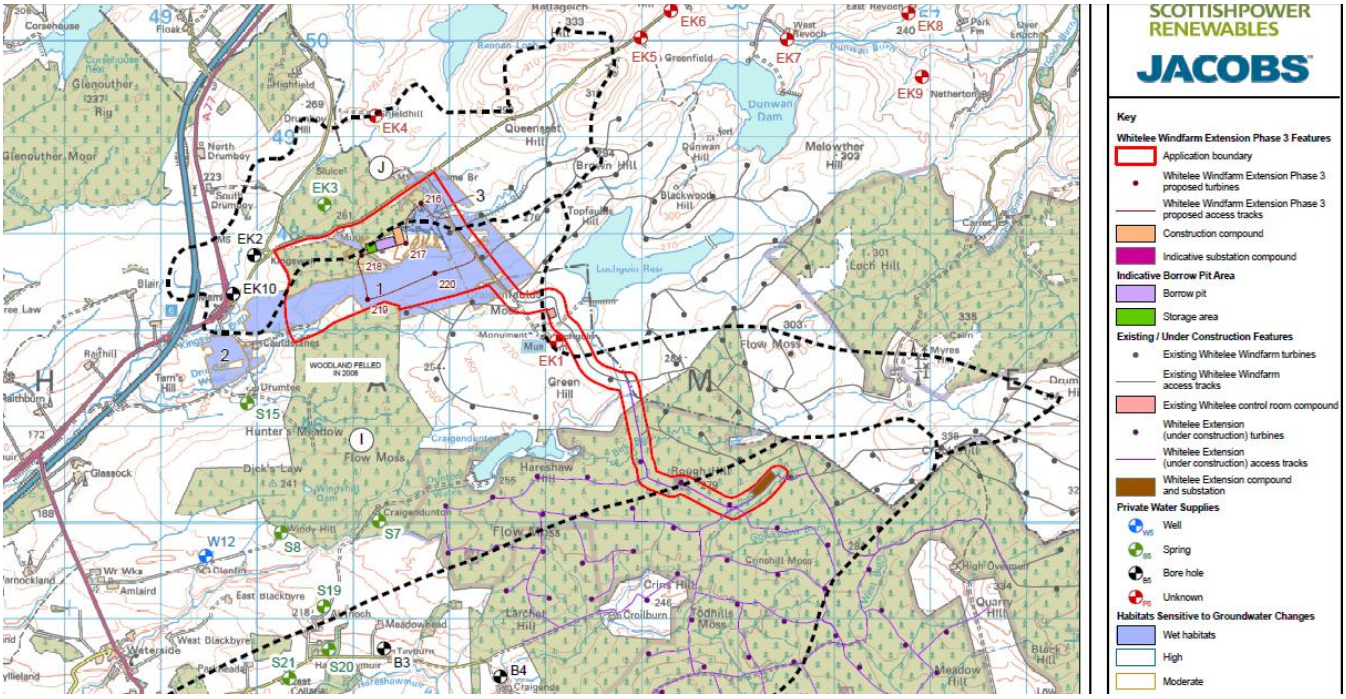


Figure 1 - From WL3 ES Figure 9.3 Hydrogeological features

Cauldstanes borehole, the nearest known PWS abstraction point to WL3, is not listed or charted at all.

Three other properties within 1500m of the development site have also not been considered or mentioned at all. (North and South Drumboy and Hareshaw Farm.

The failure to either list or chart water sources is contrary to SEPA guidance, which has been in use since 2012 **(CH 100 p3 Summary point 3. and SPRW005 *Guidance***

on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems Land Planning Use Guidance 31).

As a statutory consultee, SEPA failed to ensure relevant PWS were either identified, or that all water sources were charted, for either the WL Extension ES in 2010, or the WL3 ES in 2012. **(CH124 – WL3 ES, CH 125 – WL Ext 1, CH126 WL Ext 2).** SEPA are expected to advise authorities as to whether an ES contains adequate information to make an informed planning decision and to submit an objection if adequate information has not been included in the ES. SEPA cannot fulfill its role if the information submitted by an applicant is incomplete. SEPA did not comment upon the deficiencies in the WL3 ES to map all nearby PWS sources with grid references and did not object to the WL3 application. The Kingswell water source remains unknown and water catchment areas for the Cauldstanes and Best Friends boreholes are uncharted **(CH 124. SEPA response to WL3 planning application, CH 100 p3 Summary point 3.)**

In the preceding WLWF developments, SEPA, in combination with hydrogeological consultants for the applicant, three planning authorities and the Scottish Government were content to assume that a collection tank location was an adequate proxy for an unidentified water source. This simplistic assumption has, in our opinion, contributed to the disastrous, expensive and complete loss of water for many households and allowed the contamination of water for other properties. Protection of a water source or a supply pipe is not possible if the pipe or source is not prospectively identified. CHG submits that that is a basic concept.
It is the responsibility of the developer wishing to industrialise the rural landscape and water catchment for commercial profit, to find and protect those water sources, supply pipelines and holding tanks which may be affected or to provide households with alternative water, if water supplies cannot be definitively identified and protected.

6.4 Distance of WL3 Construction to Borehole Abstraction points

Of those borehole PWS that were monitored during preceding Whitelee developments, Ardochrig Mor borehole was 1150m from turbine 40 andLow Overmuir borehole approximately. 930m from the nearest turbine 20. These deep GW supplies suffered documented problems with bacterial contamination and peaks in siltation (despite domestic treatment systems). (**SPR W056, CHG submission 06/07/15. Matter 1, p5.**) A similar picture emerged for the WLWF Extension 1 and 2 with Craigends borehole, approximately 980m from the nearest turbine 160 and Low Overmuir borehole suffering peaks of siltation, suspended solids and bacterial contamination (**SPR W058B**). Therefore, history on this site suggests that the separation distance of Cauldstanes' borehole abstraction of 1280 m down the hydraulic gradient from the nearest WL3 turbine foundation 219, may be inadequate to provide protection from contamination.
SEPA use a simplified prescribed (but apparently arbitrary) protective 'buffer zone' distance of more than 250m as being adequate protection for a borehole or other PWS abstraction point from the point of excavation of more than 1 metre depth. (SPRW005 Land Use Planning System SEPA Guidance Note 31-). To date, it appears this policy has not provided adequate protection for those PWS surrounding the WLWF site and based on history, is unlikely to provide sufficient protection for Cauldstanes borehole abstraction if WL3 is constructed.

7 The relevant law

EA 1989 s. 36 is part of a wider scheme of regulation of the electricity industry introduced at the time of the former Conservative Government, led by Mrs Thatcher, to encourage diversification and competition within the industry. For the first time, the power to construct and generate electricity passed from the hands of the state, or state controlled bodies, into the hands of private companies. Those companies

were subject to regulation. EA 1989 was the start of that regulation, increased amended and varied many times since, both by primary and secondary legislation.

The objective, briefly, was to encourage competition and therefore to drive down prices. The National Grid, as it then was, retained responsibility for transmission and some distribution of electric power. Section 36 retains to the Secretary of State (now Scottish Ministers) the right to determine applications for electricity generating stations over a certain capacity so that, in effect, the state could control access to the grid, and consent applications where Grid capacity allows, and decline or modify them where it does not. Wind farms as we now know them did not exist in 1989, and the legislation was directed at other forms of power generation. Nevertheless, the decision has been taken to use EA 1989 as the instrument for regulating consents for larger windfarms, and for connected purposes.

Larger windfarms may influence the behaviour of the Grid, which must provide capacity for their output. For that reason, the power to consent or refuse larger applications in excess of 50MW is retained by central government. Although Energy is a reserved Matter under the Scotland Act 1998, the location of windfarms is a devolved matter, and the power therefore rests with Scottish Ministers.

Schedule 9 (3)(1) of EA1989, which is applied to s. 36 applications by EA 1989, s.38, requires that applicants in formulating relevant proposals (which include proposed windfarms of the size contemplated here)

> *(a) shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and*
>
> *(b) shall do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.*

It is for judgment whether in the circumstances the applicants have “had regard” to

a sufficient extent to these matters. **It is submitted that they clearly have not**.

8 Deemed planning permission

By the Town and Country Planning (Scotland) Act 1997 (here, TCPSA97), s.57, a consent under s. 36 EA 1989 will acquire a "deemed planning permission". That means that a separate application for planning permission is not required in such cases, but that if consent is granted, planning permission is deemed to be granted at the same time. It also means that TCPSA s.25, which bestows primacy on the development plan for each locality in the making of determinations under the Planning Acts (such as an application for planning permission), does not apply in s. 36 cases. (See generally, *William Grant & Sons Distillers Ltd, Petitioners [2012] CSOH 98,* per Lord Malcolm*)* where the point was carefully considered. Lord Malcolm called the s. 36 regime a "self-contained code".

However, that description is not quite right, since a deemed planning permission if it is to be effective, should on any view also accord with the development plan, even if the existence of that plan does not have primacy in the determination of the related application.

9 Tests to be passed

It will therefore be common ground that there are two tests in such cases; the Schedule 9 tests and the Development Plan tests.

10 Conditions

To any consent issued under s. 36, Scottish Ministers may attach conditions so far as those are considered appropriate. (EA 1989, Sch 9(5)(a)). A deemed planning permission may incorporate planning conditions in the ordinary way.

A s. 36 consent therefore may have two kinds of conditions attached to it. They are (a) "s. 36 conditions" which may be concerned with matters which do not strictly fall under the convenient classification of a "Planning Condition" and which may attempt wider control of a consent, according to circumstances, or (b) "planning conditions" which are of the more accustomed kind regulating matters which fall under planning control.

11 Generating licences

Although legal controversy has arisen recently over the interaction of that part of EA 1989 which regulates consent to construct a generating station, with that part of the Act which authorises the issue of licences to generate electricity (s. 6), no such questions arise in this case. (See generally, *Sustainable Shetland, Petitioners [2014] CSIH 60 and The Trump Organisation and Others, Petitioners [2015] CSIH 46.* The latter of these cases is now under appeal to the Supreme Court of the United Kingdom, where the issues raised in those cases should be resolved.

In summary therefore, the consent regime under EA 1989 requires Scottish Ministers, when considering an application (and the report of an Examination such as the present one, if such an Examination has taken place), must apply

- First s. 36, to consider if the application is of the requisite size
- Second, Schedule 9 to see if the applicants have "had regard" to the criteria set out there, and

- Third, the local development Plan, to see if the application conforms with it, or, if it does not, whether there any material considerations indicating why consent should nevertheless be granted.
- Fourth, they should consider whether conditions should be applied, and if so, what should be.

12 Scottish Government Energy Policy

It is not appropriate to challenge Government Policy in the present context. However, as the applicants seek to draw considerable support from current (energy and climate change) policy, it is appropriate to consider how such Policy translates through to the land use planning system, including assessing the outcome of s.36 wind farm applications and lesser sized planning applications in the light of the breadth of energy policy. The correct route, in a transparent, Plan led system, is via the consistent determination of acceptability in accordance with the Development Plan, and having regard to material considerations (including the very up to date National Planning Policy and any relevant SPG/SG).

The Scottish Government's renewables policy, which sits within UK National Energy Policy, is now well known. Despite the recent heralded subsidy cutbacks, originated by the UK Government, Scottish Ministers remain for the moment committed to promoting the increased use of renewable energy sources where is it is environmentally appropriate, and so long as impacts can be satisfactorily addressed. However, they have said nothing about contributing to the subsidies available to developers. According to Ministers, this commitment recognises renewables' potential to tackle the causes of climate change and harmful pollution, as well as their potential to support economic growth. Scottish Ministers have set clear targets for renewable electricity, announcing a series of increasing targets. The current target is for 100% of consumption to be met by renewables by 2020 with an interim target of 50% by 2015. However, this political aspiration was not accompanied by

any Strategic Environmental Assessment (SEA) until the publication of a draft SEA addressing the "Routemap 2020" which, in turn, has been followed by an updated (2013) Electricity Generation Policy Statement (EGPS) and a recent post adoption SEA statement. A 2015 Routemap is expected shortly.

The draft SEA was subject to criticism but, in responding to the criticism, the Scottish Government has made it clear that neither the Routemap nor the EGPS are promoted as a plan, programme or framework for other consents. Therefore, it is not considered necessary to analyse those documents in detail where there is very up to date policy and/or guidance available to assess the acceptability of the proposal.

In planning terms, therefore, the Scottish Government's renewable energy target is therefore simply one of a number of key considerations for Planning Authorities when updating their Development Plans and when preparing SPG/SG, and for Ministers when considering those documents. A politically driven target by itself does not presume that a consent or permission must follow for any particular site. The existence of a target does not define the outcome of this or any other application.

The Planning System has already played its full part in ensuring that the earlier 2011 interim target of 31% of electricity consumption was met. There is very considerable consented or approved capacity that has not yet been built, meaning that there is already significant progress towards the 2015 interim target and the 2020 target.

Indeed in this regard the ECDU and the Council might both be aware of the recent Scottish Renewable Energy Targets and Planning update material published by **Professor Jack Ponton**. Based on his August 2014 calculations "100% of Scotland's electricity" from renewable resources could already be more than 98% achieved by operational and consented developments to August 2014, with a large additional

capacity in planning. Consent of a further 2.284 GW of off shore wind in October 2014 now means that estimated generation from operational and consented renewables could now meet 116% of consumption. As at 18 June the majority of capacity awaiting construction was offshore (at least 4.164GW) and only 3.597GW onshore capacity was listed in the Scottish Government planning database.

That being the case any wind power being generated, in the future, from schemes currently in planning, like WL3, is effectively surplus to Scotland's requirements. Some of it may be used in Scotland, some of it may be exported (subject to interconnector and price issues) and some simply might be wasted by being constrained off. Therefore, any adverse impacts from new wind farms are being "balanced" against a target that has already been met and, therefore, it is submitted, any "need" argument for more wind farms is reduced to vanishing insignificance.

Notwithstanding the generation target point above, and the changes to the subsidy regime, at the time of writing, there is no indication of any fundamental change to current National Planning Policy as set out now in SPP2. The NPF3 and SPP2 look to strengthen spatial planning and guidance for onshore wind energy, but the basic position remains that the Scottish Government's policy direction generally favours onshore wind farm developments on appropriate sites, but it does not do so unquestioningly. In short only suitable sites should be approved. There is nothing in the weight of Government climate change or energy policy to justify approving projects that are unacceptable in terms of adverse environmental and other impacts and that are, as a result, contrary to Development Plan policy. There is nothing in any of the Government's Renewable Energy Policy that changes the law or the operation of the s.36 consenting or the "ordinary" planning system or that provides any special priority or advantage to renewables projects within either system.

13 Drinking Water Protected Areas

The entire WL3 development is within a statutory Surface and Groundwater Drinking Water Protected Area. All of Scotland's river basins are within statutory groundwater protected areas, which the exception of those river catchments which cross the English border (e.g. the River Tweed). Whitelee windfarm, including WL3, are sited on such an area (Figure 2) (The DWPA GW Map can be seen at lower scale at http://www.gov.scot/Resource/0041/00413462.pdf

Protected Surface Drinking Water Protected Areas are also defined in The Water Environment (Drinking Water Protected Areas)(Scotland) Order 2013, and Figure 2 is an extract from Map 12 defined under this Order, with the WL3 development site superimposed on such a designated area.

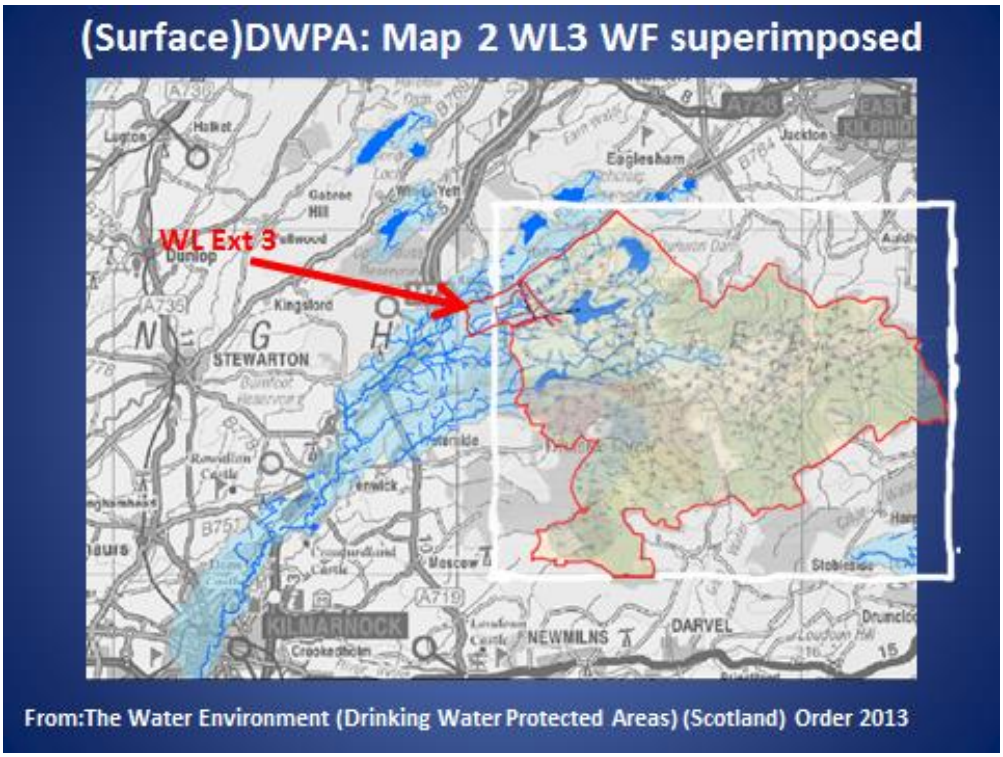


Figure 2 - Extract from 2013 Surface Drinking Water Protected Area Map 12 (CH 154) with superimposed WL3 Development site

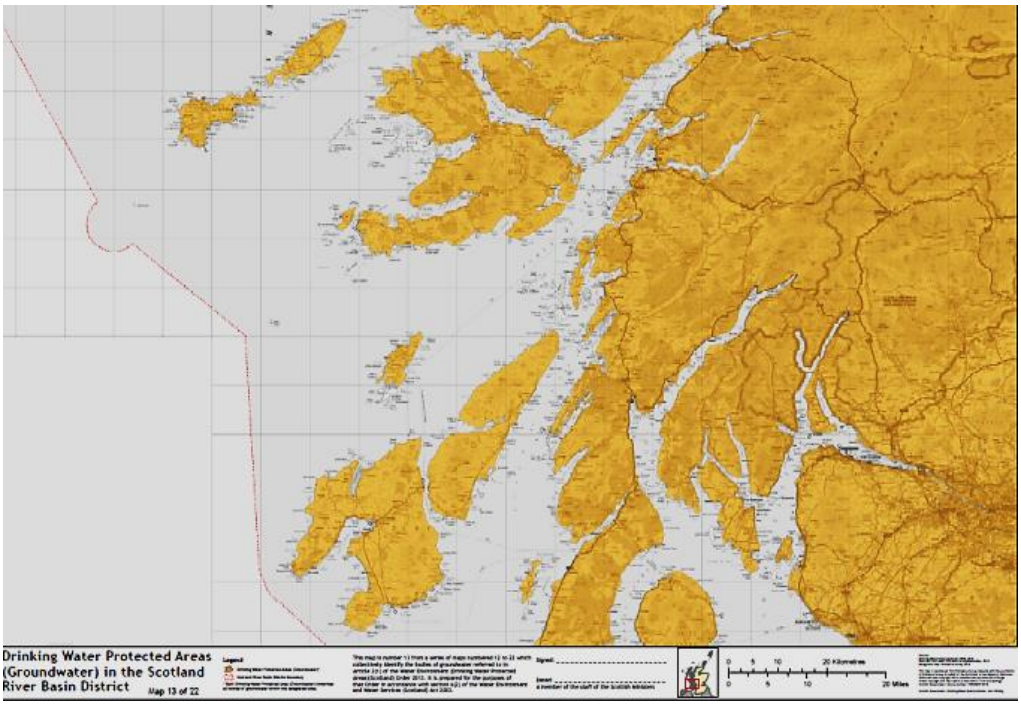


Figure 3 - Extract from 2013 Groundwater Drinking Water Protected Area Map 13

13.1 <u>The Water Environment Order:</u>

The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013

Made - - - - 30th January 2013
Laid before the Scottish Parliament 1st February 2013
Coming into force - - 11th March 2013

Drinking Water Protected Areas
2.*—(1) The bodies of surface water identified in maps 1 to 11 and the bodies of groundwater identified in maps 12 to 22(**b**) are for the purposes of section 6(1), those bodies of water in theScotland River Basin District(**c**) which are—*

(a) used for the abstraction of water intended for human consumption and either—
(i) provide more than 10 cubic metres of such water per day; or
(ii) serve more than 50 persons; or

(b) are intended to be used as mentioned in sub-paragraph (a).

(2) The maps referred to in paragraph (1) are the maps prepared for the purposes of this Order and laid before the Scottish Parliament in accordance with section 6(2).
This Order identifies those bodies of water used for the abstraction of drinking water, as required by section 6(1) of the Water Environment and Water Services (Scotland) Act

> *2003 ("the Act"). In doing so, it implements the Scottish Ministers' obligation to identify such bodies of water as setout in paragraph 1 of Article 7 of Directive 2000/60/EC of the European Parliament*

Directive 2000/60/EC of the European Parliament is the Water Framework Directive.

The Water Framework Directive (WFD) requires compliance by Member States with Council Directive 80/778/EEC, which sets standards for water intended for human consumption, regardless of the quantity of water that is abstracted for drinking purposes. The WFD defines pollution and in Annex VIII, includes an Indicative list of the main pollutants. (see below in section related to the WFD)

Whilst there are a limited number of dependent PWS directly adjacent to the WL3 site, it is quite clear that the whole proposal is sited within a designated area of protection and is therefore subject to this Order. There may be more than 50 people who will be impacted by polluted surface or groundwater who will rely on this water catchment who have not been identified by SPR and that this information has contributed to the designation of this river basin catchment as a statutory surface water DWPA, as defined under the Order in 2007 and 2013. The applicant's evidence originally disputed this, but now concedes it.

In **SPR-W011** p8 13.4, Mr Innes acting for SPR outlines the criteria that would indicate failure under requirements to comply with the The Water Environment (Drinking Water Protected Areas)(Scotland) Order 2013 (the Order):

> *13.4 Drinking Water Protected Areas have to be protected with the aim of avoiding any deterioration in their quality that would compromise a relevant abstraction of water intended for human consumption. A supply intended for human consumption would be compromised if as a result of deterioration in the quality of the water body:*
>
> *13.4.1 an abstraction (or planned abstraction) of water intended for human consumption has to be abandoned and an alternative used to provide the supply;*
>
> *13.4.2 water abstracted (or planned to be abstracted) has fo be blended with water abstracted from another source;*
>
> *13.4.3 additional purification treatment has to be applied; or*
>
> *13.4.4 the operating demand on the existing purification treatment system has to be*

increased significantly.

In assessing the collective effects of previous Whitelee windfarm developments in relation to the points made above, the following evidence from previous developments on the WL WF site is relevant:

> 13.4.1 : *an abstraction (or planned abstraction) of water intended for human consumption has to be abandoned and an alternative used to provide the supply;*

Dr Connor's evidence discloses that Scottish Water are now abandoning the public water reservoirs of Craigendunton and Lochgoin, disclosing that the Amlaird Water treatment works (WTW), which underwent significant upgrading in 2005, can no longer cope with the quality of raw water from these reservoirs. The works were designed for a maximum raw water colour of 244 Hazens, but with raw water reaching 278 H in 2008 reached a peak of 300H in the winter of 2011(The 400 H reached in 2010 was felt to be due to destratification of the reservoir and is excluded). (CH 01, p2 para 1. CH 149,Fig10., CH 39 p6 para 4). Alternative water will be supplied from Loch Katrine, North of Glasgow with the pipeline due for completion in 2017. (Please see Fig 3. For proposed course of this supply pipe)

SW have publically acknowledged that windfarm construction adversely impacts on reservoir raw water quality in their risk assessment report for Amlaird WTW in 2010 : '*Windfarm construction has coincided with an increase in raw water colour at Amlaird <u>and other Scottish Water treatment</u>* works**'** (emphasis added)(**CH 01 p9, 5.3.1**) However, for WLWF the link with the windfarm was, at that time, 'inconclusive'. *''A Scottish Water Incident Report in August 2008 reported that increases in colour coincided with windfarm construction within the Amlaird water supply catchment. The report intimated that windfarm construction may have had an effect on raw water quality, although this was not conclusive*." (**CH 01 P3 para2)** During the construction period of Whitelee Extension, <u>after the 2010 report was published</u>, raw water quality to Amlaird deteriorated still further**. (CH149 Figs 8-10)**

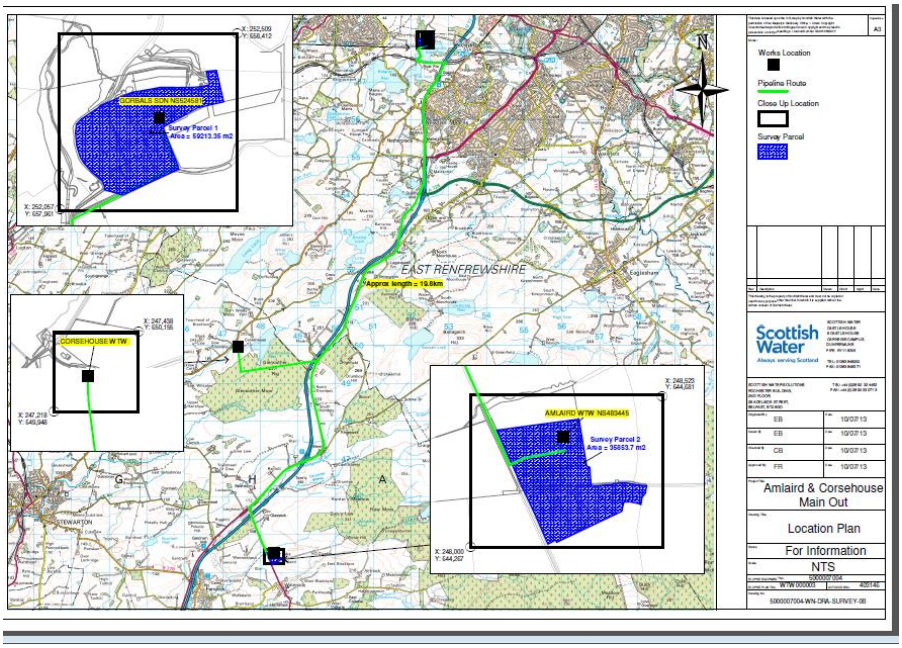


Figure 4 - Map of the proposed water pipe from S.Glasgow (Loch Katrine reservoir) to bypass the Public water reservoirs at Whitelee. (Courtesy SW)

In a recent response to an application for Glenouther windfarm (just North East across the M77 from WL3) SW have written,

> '*Scottish Water abstractions are designated as Drinking Water Protected Area (DWPA), under Article 7 of the Water Framework Directive. Corsehouse reservoir supplies Corsehouse Water Treatment Works (WTW). It is essential that water quality and water quantity in the area are protected'..and*
>
> *'We would request that turbines, infrastructure and other associated activities are located outwith the catchment to prevent any effects to drinking water quality'.**(CH144)***

It is submitted that on balance, the evidence suggests that windfarm construction on the Whitelee plateau has either caused or contributed to the need to provide an alternative public water supply which will allow SW to provide public water that consistently meets regulatory standards for potable water.

> 13.4.1 *'an abstraction (or planned abstraction) of water intended for human consumption has to be abandoned and an alternative used to provide the*

supply;

Three PWS, Cauldstanes, Best Friends (Veyatie) and Dunwan Cottage to the Northeast and North margins of the WLWF site respectively, all had to install alternative borehole water supplies, to make up for the sudden loss of their previously reliable spring water supplies – all occurring over the same 12 month period 2007/8. This loss of water at individual properties, involving two spatially distant water supplies, occurred during the peak of WLWF construction.

On a balance of probabilities, it seems likely that Whitelee windfarm construction compromised these supplies. This is evidence of both public and private water supplies destined for human consumption requiring to be abandoned.

13.4.2 '*water abstracted (or planned to be abstracted) has to be blended with water abstracted from another source'*

'Blended' and supplemented water was introduced for the Amlaird distribution system temporarily, to mitigate the problems of poor water quality and therefore reduce demands on Amlaird WTW for public supply, but there was insufficient adequate resilience in the supply network to extend this, or allow this to continue:

> *'During October 2010, increasingly poor water quality resulted in the option of reducing throughput from the works at times which resulted in lower levels in the clear water tanks (CWT). To augment the reduced flows through the works a contingency plan was put in place to use alternative supplies from Corsehouse WTW and Bradan WTW to supply 1400 customers which proved successful in reducing demand on Amlaird WTW.'* **(CH 039 p4 para7)**

13.4.3 *'additional purification treatment has to be applied; or*
13.4.4. *'the operating demand on the existing purification treatment system has to be*
increased significantly'.

'Numerous process adjustments, manning hours, manual filter washing, and process tank cleanings were undertaken by operations and process staff to alleviate the situation, however, while being successful in reducing the effect on ***both iron and THM levels, the water quality at the works breeched the PCV for both parameters for long periods'****. (CGH emphasis)*

and

'As a consequence Scottish Water is presently undertaking a full process review focussing on the potential causes of the variation in raw water quality along with DAF (dissolved air flotation system) and filter performance audits. The process review is complete and various actions have been instigated to improve plant performance as soon as possible and identify a longer term strategy should this pattern of raw water quality be repeated.

Scottish Water actions to prevent recurrence:

- *DAF nozzle change out (completed 31/03/2011).*
- *Filter media condition check (completed 29/04/2011).*
- *Investigate optimisation of saturator & chlorine control (completed 31/05/2011).*
- *Investigate swapping round the points of application of lime and ferric at the works inlet (completed 31/05/2011).*
- *Investigate dosing poly-electrolyte later in the process (completed 31/05/2011).*
- *Replace DAF recycle pumps (completed).*
- *Install iron monitor on final water (completed 31/03/2011).'*

(CH 039 p4 para8)

The evidence from EIR and FOI requests to the Ayrshire and Arran Consultant in Public Health Medicine supports the view that SW had to <u>invest in additional and remedial treatment</u> at Amlaird WTW, as a result of the deteriorating raw water quality from public reservoirs at Whitelee, occurring during the construction period of Whitelee WF and its' Extensions.This poor quality raw water caused increased levels of iron and manganese to reach the public supply, but of more concern was the production of high levels of THMs , a possible carcinogen, which exceeded DWQR drinking water standards for prolonged periods at consumers' taps. *13.4.4. 'the operating demand on the existing purification treatment system has to be increased significantly'*

'On 31st August it was brought to the PMO's attention that a complaint has been received about the water supply quality at Ardochrig Farm and Ardochrig Mor. This is in respect of increased sediment clogging filters more rapidly than normal' and 'Ardochrig borehole is designated as high risk in the April 2006 Environ 62-C10024 Environmental Risk assessment report: 'High risk of impacting supply, establish water supply arrangements because it is located immediately downhill of a proposed substation and access road.'

PMO Report 6 August 2007 ***(SPR W0 67 p85)***

Whitelee Wind Farm
Ardochrig - Private Water Supply

The owner of Ardochrig Mor, Mr [redacted], raised a complaint with Scottish Power regarding siltation of his private water supply and the need to renew filters more frequently. Mr [redacted] suspects that this could potentially be related to Whitelee Windfarm construction operations and associated activities. Scottish Power requested that Jacobs UK (JUK)

The activities potentially impacting on the siltation of this private water supply include:

- Road traffic along Ardochrig road and any associated road run-off infiltrating in the vicinity of the private water supply;
- The construction (from August 2006 to June 2007) and the operation of the nearby substation, associated settlement lagoons and discharges;
- The traffic and associated run-off from the northern Whitelee Windfarm access road and side road drainage features.

(CH 012 p1,p3)

The extract above is from a report by Jacobs UK, commissioned to investigate the cause of siltation of this monitored borehole supply, which had been satisfactory prior to WLWF construction activities.

(As far as we are aware, the additional monitoring recommendations by Jacobs in this report were not carried out and the owner was not informed that his supply was also suffering from bacterial contamination, despite his filters and UV disinfection light system. There is no evidence to the contrary.)

From the evidence presented, it appears that on multiple counts, the construction of both WLWF and WLWF Extensions have breached the terms of the 2013 DWPA Order and that the parameters defining protection of wholesome drinking water, as described in the submission for SPR within a DWPA have been breached.(SPR-W011 p8 13.4)

13.2 Groundwater

If the definition of a groundwater body is used, as in the Water Framework Directive, (Article 2,12.); then the aquifers at Whitelee provided a discrete body of groundwater within a statutory groundwater Drinking Water Protected Area under 'The Order 2013', providing superficial and deep groundwater to over 70 PWS, including those properties now likely to be affected by the WL3 development.

This affords this body of groundwater at Whitelee, the protective legislation applicable to drinking water supplies to more than 50 people.

For the WL3 development, fewer properties are likely to be directly affected than for previous windfarms, unless there is groundwater contamination which is carried preferentially via existing fracture flow pathways more distantly from the WL3 site.

13.3 Private Water Supplies (Scotland) Regulations 2006

It may be that the Private Water Supplies (Scotland) Regulations 2006, **(SPR W009 and SPR W011 section 3)** are more appropriate to provide protection to PWS adjacent to WL3 where the water catchment or source is identified within the development area.

SPR can be designated as a 'relevant person' under these Regulations as SPR now own much of the land on which WL3 is sited and will be 'tenants' and occupiers on adjoining land within the development area.

SPR have stated in their submission to DPEA:

3. Private Water Supply —Relevant Person

> *3.1 It is the "relevant person" that is responsible for monitoring and complying with the 2006 Regulations. It is for the local authority in the first instance to determine which parties fall within the classification of "relevant person" The local authority, for each private water supply within their area, determines those relevant persons. Such relevant persons shall be the person who:*
> *3,1.1 Provides the supply;*
> *3.1.2 Occupies the land from, or on which, the supply is located; or*
> *3.1.3 Exercises powers of management or control in relation to the supply.*
> *other areas on which affected PWS will rely for their sources and water catchment areas.*
>
> **(SPR W011 section 3)**

SPR has been at pains to stress that as defined under the terms of the PWS (Scotland) 2006 Regulations, there are no 'Type 'A' supplies, only Type 'B' supplies in the locality of WL3. This is correct, but as stated in **SPR W011 (4.1),** <u>all</u> water intended for human consumption is required to meet the standards of wholesome water, as defined in The Private Water Supply (Scotland) Regulations 2006.

> *4.1 The EC Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) sets bacteriological, chemical and aesthetic standards for the quality of all private water supplies, The requirements of the Directive are transposed into national legislation, in respect of private water supplies through the 2006 Regulations. The objective of the Directive and the 2006 Regulations is to protect human health by ensuring that water intended for human consumption is wholesome and clean.* **(SPR W011 4.1)**

Although <u>routine</u> monitoring and enforcement requirements are less for Type B than Type A supplies, the criteria for meeting the drinking water standards for test parameters and therefore wholesome water is the same. Does categorizing a water supply as 'Type B' absolve SPR from responsibility to maintain standards for that supply ?

If at any time the local authority believes aType 'B' PWS may fail to meet the defined standards for wholesome water, they may conduct an extended set of test parameters above and beyond that set out in Table D, Schedule 1. , which will include minerals, bacteria and various chemicals and the standards that apply to

those results are the same as would apply to results from a Type 'A' PWS test result, as set out in Schedule 1. Table A to D of the Regulations. This is set out clearly in 7,29 and 30 of the regulations:

> *Private Water Supply (Scotland) Regulations 2006* ***(SPR W0 09)***
> *Water Quality :*
> (p 22)
> *29.—(1) For the purpose of determining whether a Type B supply satisfies the provisions of regulation 7(3), a monitoring local authority may take or cause to be taken, and analyse, or cause to be analysed, from any Type B supply located within its area such number of samples, if any, of water which the authority considers is necessary to establish whether the supply is wholesome.*
> (p 8)
> *7 (3):The requirements of this paragraph are–*
> *(a) that the water does not contain–*
> *(i) any micro-organism (other than a parameter) or parasite; or*
> *(ii) any substance (other than a parameter),*
> *at a concentration or value which would constitute a potential danger to human health;*
> *(b) that the water does not contain any substance (whether or not a parameter) at a concentration or value which, in conjunction with any other substance it contains (whether or not a parameter), would constitute a potential danger to human health; and*
> *(c) that the water does not contain concentrations or values of the parameters listed in the second column of Table D in Schedule 1 in excess of or, as the case may be, less than the prescribed concentration or values.*
>
> *Additional Monitoring*
> *30.—(1) This regulation applies to any Type B supply sampled by a monitoring local authority in accordance with regulation 29.*
> *(3) The conditions specified in this paragraph are that–*
> *(a) the supply may have or contain a property, element, micro-organism, parasite or substance not listed in Table C of Schedule 2; and*
> *(b) the monitoring local authority reasonably believes that the concentration, amount or number of the property, element, micro-organism, parasite or substance may be such that it may (whether alone or in combination with a parameter or any other property, element, micro-organism, parasite or substance) cause the supply to fail to satisfy the provisions of regulation 7(3).*

Mr Innes in his submission appears to have only considered the requirement of routine testing of Type 'B' supplies. Table D, included in his summary, refers only to routine testing requirements:

4.3.4 The levels do not exceed or fall below the concentrations or values of the parameters listed in the second column of the following table which is contained within the 2006 Regulations2:- (**SPR W011 4.3.4**)

Table D

4.3.4 The levels do not exceed or fall below the concentrations or values of the parameters listed in the second column of the following table which is contained within the 2006 Regulations[2]:-

(i)

(1) Item	(2) Parameters	(3) Concentration or Value	(4) Units of Measurement
1.	Coliform Bacteria	0	number/100ml
2.	Conductivity (i)	2500	µS/cm at 20°C
3.	Enterococci	0	number/100ml
4.	*Escherichia coli (E.coli)*	0	number/100ml
5.	Hydrogen ion	9.5 6.5 (minimum)	pH value
6.	Lead	(a) 25, from 3/7/06 until 24/12/13 (b) 10, from 25/12/13	µgPb/l
7.	Nitrate	50	$mgNO_3/l$
8.	Odour-qualitative	-	-
9.	Taste-qualitative	-	-
10.	Turbidity	4	NTU

SPR is clearly responsible. Regrettably, the history from the previous WLWF Extensions development suggests that the corporate ethos dictating behaviour is that SPR will try and avoid any responsibility, statutory or otherwise, towards PWS which may rely on actually *identifying* water sources, or water catchments sited within the windfarm development area, and which might therefore result in acknowledging their corporate responsibilities towards protecting or remedying any damage to those supplies – and therefore to individual people - caused by windfarm development.

This is evidenced by the approach taken by SPR into responding to previous complaints of contamination of the large Airtnoch PWS and the Kingswell supply, as well as the lack of 'remediation' provided to the Ardochrig Mor supply. **(CH 153 letter from EAC, Mr Elliot Davis, (Kingswell) evidence to PLI, CH 82 – Jacobs report Ardochrig Mor)**

Evidence from other SPR windfarm neighbours at Cruach Mhor in Argyll would suggest that the reluctance to address problems caused to private water supplies is not confined to the previous history at Whitelee**. (CH 103)**

As there seems to be no reliable mechanism by which the responsibilities imposed by the Private Water Supplies (Scotland) Regulations 2006 are enforced, there is little or no reassurance for windfarm neighbours who may suffer associated loss of, or contamination of, their water supplies, as a result of windfarm related activity during construction, operation or decommissioning.

It is submitted that this should weigh heavily in the balance against the application when considering whether or not to grant it.

13.4 <u>The Water Framework Directive.</u>

The terms of The Water Framework Directive, DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2000 established a framework for Community action in the field of water policy.
The **EU** Water Framework Directive (2000/60/EC) came into force on 22nd December 2000. It was required to be adopted into municipal law, i.e. UK statute, by all Member States.

Details of the Water Framework Directive (WFD) are referred to in **SPR WO06.**

The leading statement in this Directive should lie at the heart of considering any industrial development on Scotland's water catchment areas, whether public or private:

> ***(1) Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such.***

The WFD defines in Article 2: 12. 'Body of groundwater' means a distinct volume of groundwater within an aquifer or aquifers.
The WFD requires compliance by Member States with Council Directive 80/778/EEC, which sets standards for water intended for human consumption.
There is no "excdeption" within Directive 80/778/EEC, that a minimum quantity of water intended for human consumption will be excluded from the terms of that Directive. (for example the WFD refers to other aspects of legislation which will be applied to water bodies to be used for drinking water abstraction only if they exceed 10 cubic metres /day).

The WFD defines pollutants and in particular, in ANNEX VIII, includes an Indicative list of the main pollutants.
These include:

> *1. Organohalogen compounds and substances which may form such compounds in the aquatic environment.*
> *4. Substances and preparations, or the breakdown products of such, which have been proved to possess carcinogenic or mutagenic properties or properties which may affect steroidogenic, thyroid, reproduction or other endocrine-related functions in or via the aquatic environment.*
> *7. Metals and their compounds.*
> *8. Arsenic and its compounds.*

Of those 'listed pollutants', groundwater monitoring at the WLWF site provided evidence of:

1. **Organohalogens**: 2,4,6-Trichlorophenol, 2,4-Dichloro-3-methylphenol, 4-chloro-3-

methylphenol, Benzob/k0Fluoranthene, Chloroform

2.Endocrine toxins: Bis (2-ethylhexyl)-Phthalate, Diethyl phthalate

7. **Metals**: Aluminium, Iron and Manganese in excess of baseline and of Environmental and Drinking water standards.

8. Arsenic

Baseline GW monitoring for WLWF in 2006 showed no evidence of the semivolatile compounds listed in 1, or the endocrine toxins listed in 2. (CH 156 4.1 p4) No preconstruction, baseline monitoring occurred for heavy metals(e.g.arsenic)

On the basis that listed pollutants have appeared in groundwater, it would appear that the development of the preceding Whitelee windfarms have violated the terms of the WFD.

Requirements of the Water Framework Directive (2000/60/EC)

As one of its main environmental objectives, the Water Framework Directive requires all surface water and groundwater in the European Union to achieve 'good status' by December 22 2015.

To achieve this goal, all surface water and groundwater must achieve both good chemical and good ecological status. There are five levels of classification for ecological status: very good, good, moderate, poor and bad. There are only two levels of classification for chemical status: good and bad.

Classifications are based on certain quality factors and substances, including the concentration of specific 'listed pollutants', as listed above and for surface waters, the ecological assessment of fish and invertebrates, phosphates and oxygenation conditions ..

There is a clause which requires that water bodies should not deteriorate.

Article 4 of the Directive requires member states not only to achieve good status, but also to take measures against all new "deteriorations of the status" of bodies of water. Even stricter requirements are in place with regard to new or increased discharges of pollutants.

13.4.1 Groundwater

The evidence from 2006 -2009 WLWF GW monitoring is that synthetic chemicals appeared in GW that were not present in baseline monitoring and that some of these chemicals (toluene and 3/4 methylphenol) were present in post construction monitoring **(SPR W022 p41,42).**

'Listed pollutants' were found in high quantities in GW during WLWF construction. Limited post construction GW testing on the WLWF site in preparation for the WLWF Extension 1 and 2, showed persistent and significant quantities of arsenic, another listed pollutant.

Deterioration of chemical (pH) and mineral composition of GW occurred between 2006 – 2009, with persistent high mineral content of GW detected on the site (*Figure 5, Figure 6 and Figure 7*) These changes extended into the GW sampling conducted in 2010. **(CH 156, CH157, SPRW022, SPR WO59)** These adverse, mineral changes have therefore continued in GW over at least 5 years compared to baseline values in 2006.

It should be noted that although standard, accredited procedure is to filter water samples at the well head for metal analysis (as was described by Dr Lee at the PLI),at the request of Jacobs Ltd, additional microfiltration with a 45 micron filter was introduced at SAL laboratories, to try and reduce the mineral content of the samples.

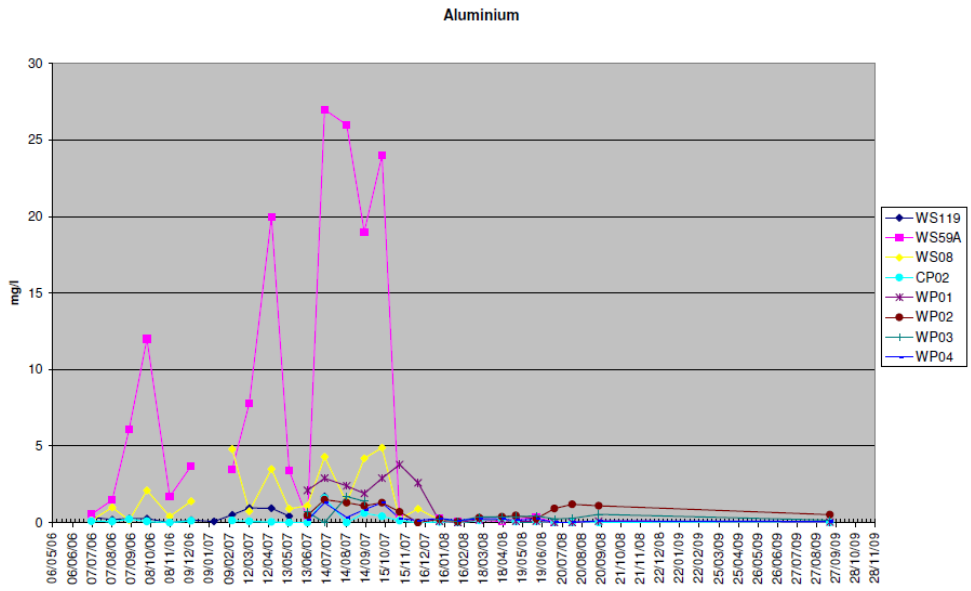


Figure 5 - Increasing aluminium in groundwater .(Jacobs 2009)

NB. From February 2008 additional microfiltration reduced mineral GW levels as recorded in the laboratory)

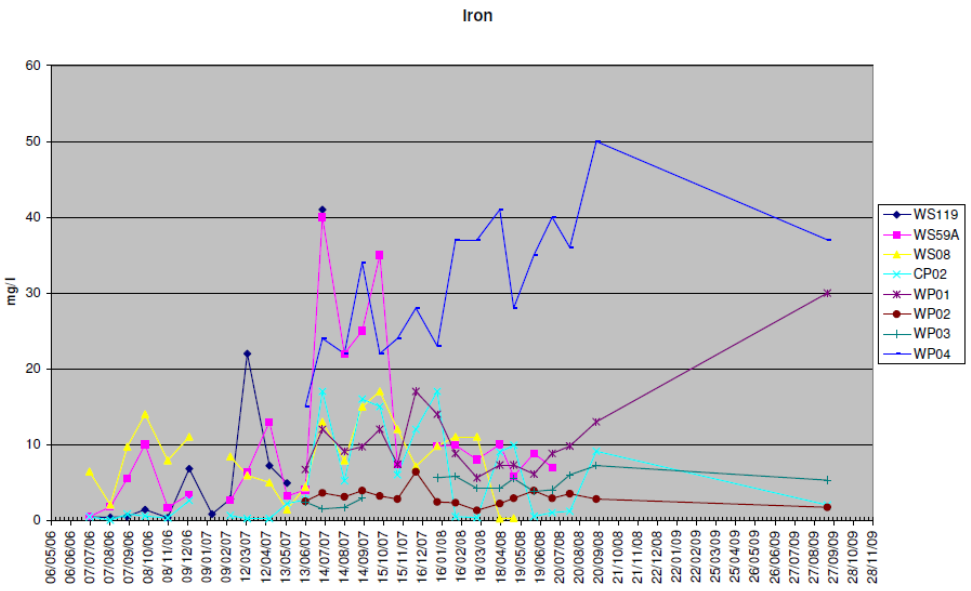


Figure 6 - Increasing iron in groundwater .(Jacobs 2009)

NB. From February 2008 additional microfiltration reduced mineral GW levels as recorded in the laboratory)

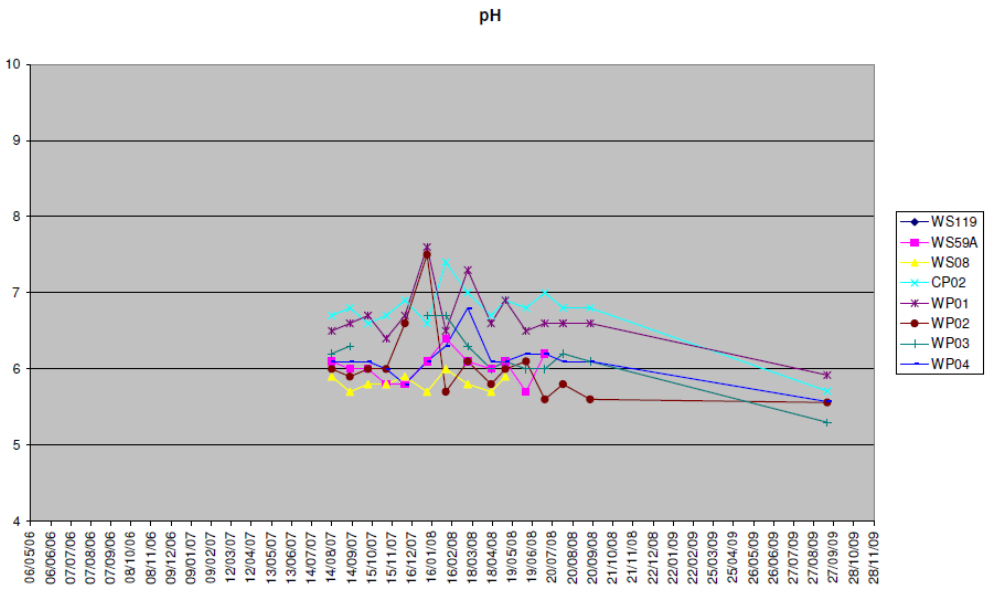
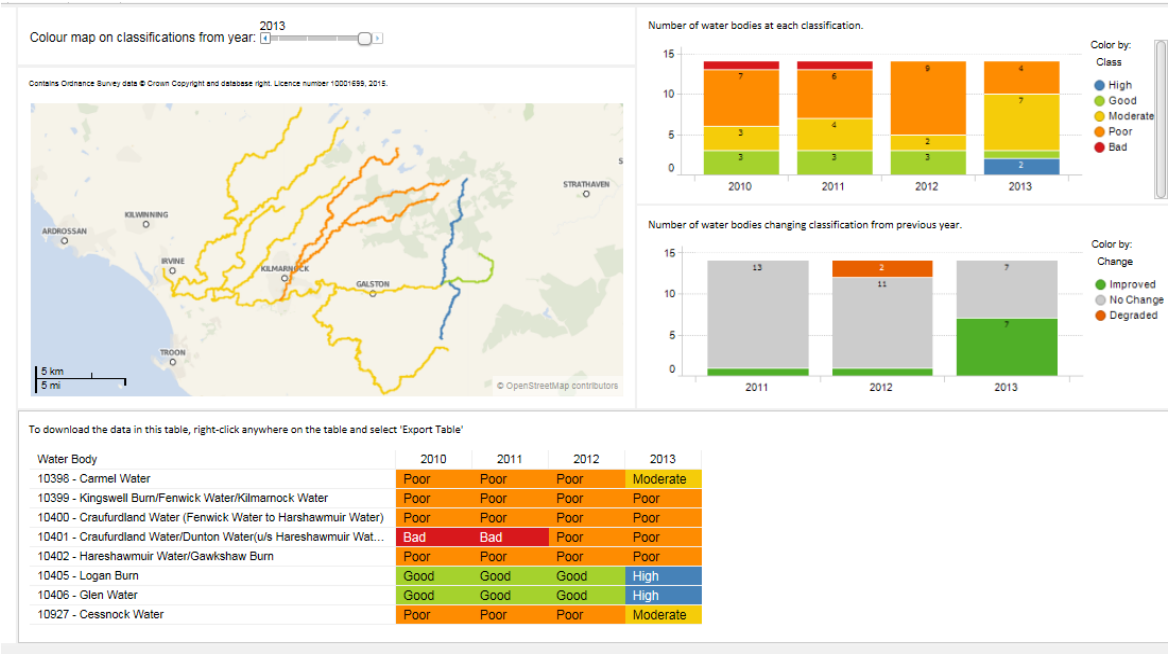


Figure 7 - Trend of decreasing pH in GW across all boreholes

13.4.2 Surface Waters

Key surface waters for the Whitelee development area have been identified by SEPA as tributaries for classification and management of the river basin status of the River Irvine under the terms of the WFD. These are Kingswell, Craufurdland , Hareshawmuir and Glen Burn waters. Of the eleven key River Irvine tributaries, only three are assigned a 'poor' status as at 2013 and all three originate from the Whitelee plateau: Kingswell, Craufurdland and Hareshawmuir waters. (*Figure 8*). All other seven River Irvine tributaries show an improved status and the above named waters show none. Only one tributary, arising from the South of the Whitelee site, Glen Burn, shows improvement in 2013 from a good to a high overall status. (http://www.environment.scotland.gov.uk/get-interactive/data/water-body-classification/)



Water Body	2010	2011	2012	2013
10398 - Carmel Water	Poor	Poor	Poor	Moderate
10399 - Kingswell Burn/Fenwick Water/Kilmarnock Water	Poor	Poor	Poor	Poor
10400 - Craufurdland Water (Fenwick Water to Harshawmuir Water)	Poor	Poor	Poor	Poor
10401 - Craufurdland Water/Dunton Water(u/s Hareshawmuir Wat...	Bad	Bad	Poor	Poor
10402 - Hareshawmuir Water/Gawkshaw Burn	Poor	Poor	Poor	Poor
10405 - Logan Burn	Good	Good	Good	High
10406 - Glen Water	Good	Good	Good	High
10927 - Cessnock Water	Poor	Poor	Poor	Moderate

Figure 8 - From SEPA: 2013 Water Body Classification for the River Irvine

During the course of constructing WLWF and WLWF Extensions, the water body classification, under the terms of the WFD deteriorated in the Hareshawmuir water from an overall status of moderate to poor, from 2007 to 2009 and remains at poor, the Craufurdland water deteriorated in overall status from moderate (below Waterside) and poor(above Waterside) to poor and bad respectively from 2007 to 2009, remaining poor in 2013(last available classification date).

Kingswell water, which will be impacted by the WL3 development had an overall status of bad in 2007 and improved to poor, in 2009, but remains poor in 2013.

The status of all these water bodies prior to construction activities of WLWF in 2006 is unknown to us.

Thus there is documented deterioration of surface water body overall status, with an overall grading of poor, involving the majority of the Whitelee windfarm catchment area occurring over the period of development of WLWF and its extensions.

The deterioration of surface water quality in relation to windfarm construction and associated deforestation has been extensively investigated by researchers at the Universities of Glasgow and Edinburgh.**(CH 110, CH068, CH028)**

This independent evidence documents <u>deterioration</u> of surface waters related to construction periods of WLWF, contrary to the terms of the WFD.

From the reports of the ECoW and PMO and from the surface water monitoring results for WLWF and WL Extensions, **(SPR W062-77 and W080-108, SPR W057, CH 149 section 3, 169.)** it seems very likely that there will be adverse impacts on surface waters which may feed into the already poor overall water quality status for Kingswell water. As this water body is required to show improvement to a status of 'good' by the end of this year 2015, and thereafter show *no deterioration*, further deforestation and windfarm construction activities for WL3 will risk the statutory requirements in achieving and maintaining that goal.

Exemptions from the 'no deterioration' clause in the WFD are allowed only in exceptional cases – in particular, where there is both an overriding public interest for the new project and no alternative environmental option (Article 4(7) of the directive).

It would appear that the addition of five turbines to the existing 215 Whitelee turbines is unlikely to satisfy the conditions which would allow an exemption from meeting requirements under EU Water Framework Directive (2000/60/EC)

14 Local Planning Policy

EAC Policy ENV24: The Council will presume against any developments which

(1) Have an adverse effect on the water environment by increasing levels of pollution or detrimentally impact upon WATER QUALITY, aquatic habitats for wildlife or recreational amenity;and

(2) Have an adverse effect on groundwater or major aquifers.

Adopted EAC Local Plan p67.

On the grounds that similar hydrogeological concerns will prevail for WL3 as for preceding Whitelee windfarms and that the same best practice mitigation measures are proposed as were previously employed, which were patently unable to prevent adverse pollution in surface water, groundwater, and mitigate against apparent loss of, and contamination of private water supplies related to windfarm construction, it would appear that WL3 is likely to have such effects as described in (1) and (2).

Whilst the documented evidence of such likely adverse effect on hydrology was not before EAC when WL3 was considered by Planning Officers in 2012, this should now be considered before the Reporters as a material consideration in determining this application.

15 Planning Conditions

15.1 Conditions for WLWF- The History.

Under Condition 7.1 for WLWF in 2006, a monitoring plan was to be submitted to the Local Authorities 3 months prior to construction commencing.
"The Construction and Operation of a Wind Powered Generating Station at

Whitelee. Planning Consent Response by CRE Energy" as a requirement of Condition 7.1

This planning consent response, provided to CHG by Ironside Farrar prior to the Inquiry, (CH 159) details protective and mitigation measures for the hydrological environment in general. It details surface and groundwater monitoring sites, test parameters and testing intervals.

Of note within the Planning Consent Response for Condition 7.1 :

> *P3. Scottish Power has agreed an Environmental /Pollution Incident Plan (EPIP) with Scottish Water for waters within Scottish Water supply reservoirs and their catchments.*
>
> *P4 and p5. SEPA will be contacted in relation to any incident which may result in a significant impact on the water environment*
>
> *P5. (Groundwater) results shall be tabulated and plotted in graph form and periodically sent to the Councils. The results will also be made available to SEPA, if requested by SEPA.*
>
> *P5.If required testing will be carried out on a quarterly basis during the operational phase for a period of one year after the construction phase.*
>
> *P5. PWS were to have quarterly monitoring and the results shall be tabulated and plotted in graphical form and periodically presented to the Councils.*
>
> *P6 Prior to construction commencing every household identified above (* included in a tabulated list of PWS including Airtnoch supply to 10 households*) shall be supplied with an emergency contact sheet with a contact name at SPR and the local EHO.*
>
> *P6 In the event of an incident , which has the potential to impact the quality or quantity of potable water supplied to a resident, the following steps shall be taken:*

- *The property owner will be contacted and informed of the incident at the earliest opportunity*
- *If required …. Bottled water will be supplied to affected householders*
- *The relevant EHO shall be contacted advising them of the incident and consulting on prosed measures to deal with the incident.*
- *SEPA will be contacted in relation to any incident which may result in a significant impact on the water environment.*

It is clear there are responsibilities that fall on the Councils to ensure that mitigation measures to protect PWS are adequate and that monitoring results provided by SPR or their agents are regularly reviewed.

It should be questioned why Councils considered that 'routine' Type 'B' monitoring test parameters and quarterly test intervals for PWS were in any way adequate, when those water supplies originated on an industrial construction site.
Despite this, it is clear that there was a failure to meet the defined terms of the Planning Consent Response and therefore Condition 7.1.

Whilst EAC received, but did not act on, PMO summary reports of surface, groundwater and PWS monitoring results, the Council did not separately receive the actual PWS monitoring results, nor the Groundwater monitoring results.
There was no definition in 7.1 of what constituted an incident, so that although there was a gross failure of PWS to meet defined standards of wholesome water, to the detriment of human health, the relevant EHO was not informed. Householders were not informed, as was required, and alternative water supplies were not provided.

Those households who lost their water supplies altogether, who had been deemed 'low risk' and were therefore not being monitored, had no mechanism of reporting their concerns or their catastrophic loss of water. Other households who were being monitored on a collective supply (Airtnoch) received no information or contact details at all.
For Airtnoch PWS, their risk assessment had made it quite clear to SPR that there were 10 households on this supply. Therefore, failure to provide information and contact details to individual households was inappropriate and failed to meet the terms of the planning condition response.

15.2 <u>Conditions For Whitelee Extensions 1 and 2 (SPR W013)</u>

Consent Notice 29. *In assessing the hydrological impacts of the development, the Scottish Ministers consider it necessary to protect water quality and control pollution. SEPA advised Scottish Ministers that the proposal accords with the* ***Water Framework Directive*** *and is capable of being authorised. (CHG emphasis)*

Information gained under FOI indicates that SEPA had not considered the impact on surface waters from the original WL site which had resulted in downgrading of two water bodies(Hareshawmuir and Craufurdland waters) and a consistently poor classification of a third(Kingswell water)(contrary to the terms of the WFD) and SEPA had not requested or received groundwater monitoring results available from 2006 to 2009 for WLWF which had shown further compliance failure under the terms of the WFD.

Whitelee Extension 1 and 2 Conditions 6.44 and 6.45 Apply (SPR W013):

> *6.4 No development shall commence until a Construction method Statement(s) (which shall be implemented as approved) has been submitted in writing to and approved by the East Ayrshire Council.*

The Decision letter **(SPR W014)** references conditions 6.7 and 6.9, which details mitigation measures to address environmental effects and the relevance of the monitoring plan.
There is reference to arrangements for Surface water Monitoring (Part 1.) Groundwater Monitoring (Part 2.) and Monitoring and mitigation arrangements for PWS (Part 3.)

The Monitoring Plan for WL WF Extensions (2010) Conditions 6.8 and 6.9 **(CH 79)**

2. Groundwater Monitoring
6 boreholes are proposed, as per the number of monitoring locations for Whitelee Windfarm, with monthly GW levels and quality recorded. Samples shall be sent for laboratory analysis and the results to be tabulated and plotted in graph form and periodically presented to the 3 Planning Authorities.

Groundwater level and quality to be monitored by monthly inspections and results recorded for each borehole. Samples to be sent for laboratory analysis and the results periodically presented to the 3 Planning Authorities.
The results to be made available to SEPA, if requested by SEPA.
A GW baseline would be established by taking initial readings prior to construction commencing in summer 2010 with monthly data collection thereafter during the construction phase.

3. Private water supplies.
Those PWS listed below were considered to be at risk and monitored for Whitelee WF Extension.

Private Water Supplies

No.	Property Name	Hydrogeological Catchment	Easting	Northing
1	Craigends	C	252590	643269
2	Low Overmuir	A	257671	643996
3	Craigendunton	D	251267	645015
4	Airtnoch (Hareshawmuir properties)	C	251592	644395

'PWS shall be tested quarterly with test parameters, as for WL WF to comprise those conducted for routine testing of a Type 'B' PWS. (Table D Schedule 1 of Private Water Supply (Scotland) Regulations 2006)
The results shall be sent periodically to the Councils.'

'Prior to construction commencing every household identified above shall be supplied with an emergency contact sheet, outlining the following details:

- ***Contact name and number at ScottishPower Renewables; and***
- ***Contact name and number for the local Environmental Health Officer***

In the event of an incident, which has the potential to impact the quality or quantity of potable water supplied to a resident, the following steps shall be taken:

- ***The property owner will be contacted and informed of the incident at the earliest opportunity;***
- ***If required, bowsers containing water and/or bottled water will be supplied to affected householders, and***

- *The relevant Environmental Health Officer shall be contacted advising them of the incident and consulting on proposed measures to deal with the incident.'* **(CH 79)**

For Whitelee windfarm Extensions, no PMO was employed. Perhaps this explained why no PWS or groundwater monitoring results were sent to East Ayrshire Council during the construction period.

Craigendunton PWS, which was considered medium risk for PWS pollution was not monitored at all.
Households on the Airtnoch, Craigendunton and Low Overmuir supply were given no contact details for either SPR or the contact EHO.

No residents were informed of their PWS monitoring results for either WLWF or for WL Extensions, until 2013 after construction of both WLWF and WLWF Extensions were complete.

No residents were informed of the failings and immediate danger to health resulting from gross bacterial contamination of their water supplies.

Neither EAC nor residents were informed of arsenic (a category 1 pollutant), exceeding drinking water standards, found in GW in preconstruction sampling on the site, so that PWS test parameters could be extended to monitor appropriately.

CHG has been unable to obtain the groundwater monitoring results, required to comply with planning condition6.8 and 6.9, from any authority (including a request to Environment Minister Aileen McLeod, see CH-26) and SPR have repeatedly not complied with CHG's request for these groundwater monitoring results.

On multiple counts, it appears that SPR have failed to comply with planning conditions to protect and mitigate for Private Water Supplies for both WLWF and WL WF Extensions.

CHG has already been informed about how some windfarm companies view the issue of compliance with planning conditions, through involvement with an Appeal for the adjacent Sneddon Law windfarm (CWP Ltd) that, '***there is no requirement in planning terms for there to be confidence that the windfarm company will actively strive to comply with the condition, since that is the purpose of the enforcement jurisdiction'*** (counsel for developer CH 064 3.2 para 6).

Accordingly, CHG has no confidence that the current system of enforcing planning conditions is adequate and that consenting WL3 will once again not only subject households to potential loss of water quantity and quality, but endanger health.

16 Specific Water issues

16.1 Groundwater and Chemical Contaminants:

Chemical and mineral contamination is described more fully in 'The Water Evidence' (CH 149 4. 2).

Additional comment here is related to new evidence lodged with DPEA :

New information was lodged by SPR at the Inquiry – **SPR W059** Preconstruction GW and soil sample results for Whitelee Extension 1 and 2 and **SPR W108** : Cement

composition reports for WLWF and WLWF Extensions

In addition, extensive new material was released to third party objectors, at the request of SPR, just before the PLI, via Ironside Farrar, Planning Monitoring Officers for WLWF.

These documents included:

1. Planning Consent 7.1 response **(CH 159)**
2. ECoW Monthly Reports 1-28 **(SPR –WO80-WO107)**
3. 'Whitelee Wind Farm, Ardochrig - PWS' Jacobs Report **(CH 12)**
4. Whitelee Post Construction Report Oct 09 **(SPR W022)**
5. Groundwater Quality Monitoring Initial report July 2006-Aug 2006, Jacobs Babtie, Sept 2006 **(CH 156)**
6. Groundwater Quality Monitoring Interim report July 2006-Nov 2006, Rev 1, Dec 2006 (text only)
7. Groundwater Quality Monitoring Interim report . Jacobs July 2006-Sept 2008 **(CH 157)**
8. Surface waters outwith SW area monitoring results **(SPR W057)**
9. Surface waters within SW area monitoring results **(SPRW057)**
10. Private water supplies monitoring results **(SPR WO56)**
11. Environmental Risk Assessment. Private Water Supplies, Whitelee Windfarm, Scottish Power Renewables, Environ UK Ltd,**(SPR-W036)**
12. PMO Progress Reports1-15 **(SPR W062-76)**

Full laboratory reports for GW monitoring during 2006 – 2009 in Jacobs Groundwater Quality Monitoring Interim report July 2006-Sept 2008, were provided to CHG by Ironside Farrar just prior to the Public Examination. Due to the time scales involved, only the full results for the December 2007 round of monitoring were lodged with DPEA and presented to participants at the PLI. **(CH 157)**

16.2 <u>Bis (2- ethylhexyl)phthalate (DEHP)</u>

SPR have previously attributed the unexpected detection of DEHP in GW to laboratory error, **(313,314, CH 149)** but they did not conduct any investigation into the abnormal monitoring results, despite comment made by the PMO in December 2006 Report 2,

> *'' The reported lack of detection of semi-volatile organic carbon compounds did not hold for bis(2ethylhexyl)phthalate which was detected on 4 September 2006 at all four boreholes (57-67µg/L). Values were elevated compared with the WHO guideline 8µg/L, the Dutch Serious Risk Concentration (SRC) for groundwater (4µg/L), but not the maximum SRC for drinking water = 133µg/L).Although these compounds are not expected to be present in substantial quantities, given the lack of detection of other VOCs/ SVOCs, comment is required for the change in LoD for 7 November 2006 for dibenz(ah)anthracene, 2,4,5 trichlorophenol and hexachloroethane (considering their toxicity).''* **(SPR-W063)**

A sample laboratory report for 24 December 2007 from the Jacobs Report **(Groundwater Quality Monitoring Interim report . Jacobs July 2006-Sept 2008 -CH 157)** has been submitted by us to DPEA.
This laboratory report, December 2007, states values of DEHP (Bis 2 di ethylhexyl phthalate) up to 1000ug/L within borehole CP02. (WHO guideline drinking water limit 8ug/l)
At the same time the 'laboratory blank' on this date returned values of <10ug/L.
(The laboratory report for 08/01/08, when DEHP levels reached 3200ug/L was not included in the interim Jacobs Report from Ironside Farrar.)

Laboratory blanks are used as a 'quality control'. As DEHP is a ubiquitous substance which can leach out of plastics into water, traces of DEHP can sometimes be found in 'control' samples. Laboratories will normally have a reference range within which such 'normal' trace levels will be found in control samples. **(CH 146 UKAS Laboratory Accreditation Standards, in 2006-2009 e-mails, 2015)** The finding of a trace level in the laboratory blank means that a similar value in the test sample should be regarded with caution, as this may be due to a false positive, due to unavoidable 'laboratory error' in the processing technique.
On 05/12/07, the laboratory blank was less than 10ug/l (the limit of detection- LoD),

when the sample results from borehole groundwater ranged from 120ug/l to 1000ug/l. The lack of DEHP in the laboratory blank indicates that such a high test value was most unlikely to be due to laboratory error, as had been stated previously by SPR.

Review of worldwide literature have shown that the levels of DEHP, a recognised endocrine toxin, at Whitelee within groundwater samples , which peaked at 3200ug/l, are higher than any other environmental groundwater results we have been able to obtain. **(CH 038 European Union Risk Assessment Report BIS(2-ETHYLHEXYL) PHTHALATE (DEHP) CAS No: 117-81-7 EINECS No: 204-211-0 RISK ASSESSMENT p120)**

These include reference samples adjacent to industrial waste sites and downstream from phthalate manufacturing plants as well as samples obtained as 'normal values' from UK boreholes and from boreholes with values considered high for DEHP. Records from 1995 to 2015 recorded the highest level of DEHP in groundwater at 20ug/L for groundwater from boreholes in Wisconsin, where 70% of the population depend on GW for drinking water. **(CH 54 Wisconsin DNR GW results for DEHP 1995-2015).**

The EU chemicals regulation REACH (Registration, Evaluation and Authorisation of Chemicals) categorise DEHP as a Substance of Very High Concern (SVHC). DEHP is a Priority Hazardous Substance for surface waters under the EU Water Framework Directive (WFD) **(CH 119. SEPA reply re. Jacobs report 2009 and DEHP 2015)**

In Dr Lee's Inquiry submission **(SPR W079 p13.),** he has made a number of statements regarding the discovery of DEHP in groundwater at Whitelee windfarm..

- He states *DEHP was observed pre construction* – **This is incorrect.**
  Jacobs baseline groundwater monitoring July-August 2006 **(CH 156),** shows no evidence of DEHP or other semivolatile (SVOC) organic compounds in any

boreholes.

- *It has been observed in laboratory blanks*. The highest recorded value in a laboratory blank was 78ug/l on 16/04/08. The highest GW borehole test value on that date was 120ug/l. The significance of that test result would have had to be regarded with caution, in view of the high laboratory blank value. However, most laboratory blank results on other dates, recorded values below 10ug/l, which makes DEHP levels of sample results into the hundreds and thousands, unlikely to be due to laboratory error.

- *'it is separated by significant distances and time'* – Only 6 boreholes were installed across the whole site and at times, only four were functioning; this would necessarily result in significant separation distances. Timing of results was dictated by routine monthly sampling frequency.
  Despite the abnormal laboratory results being highlighted to Jacobs/SPR, samples were <u>not repeated</u> to determine if these were consistent and meaningful and sampling frequency was not changed; there was no investigation into the cause of the abnormal results.

- *If present this analyte* (DEHP*) would be rapidly attenuated in the water environment: soil sorption (KoC 4 to 5), short half-life and dilution would quickly reduce contaminant mass –*
  The measured sample was **<u>in groundwater, not soil</u>**; it is probably irrelevant what was happening with regards soil sorption with regard to the fact that results were from GW.
  Negligible aquatic degradation of DEHP is likely at 4^0C, **(CH 038 European Union Risk Assessment Report BIS(2-ETHYLHEXYL) PHTHALATE (DEHP) CAS No: 117-81-7 EINECS No: 204-211-0 RISK ASSESSMENT 3.1.2.1.2)** although slow degradation might be expected at the recorded GW temperatures of 6 to almost 12^0C at Whitelee.**(CH 13 Jacobs 2009**).

This is important when considering the life span of DEHP within GW temperatures on this site and the whether DEHP could be transported in GW to PWS and other water supplies (public reservoirs) in significant quantities. With fracture flow dependent GW and limited aquifers in the Whitelee bedrock geology there may well have been fairly rapid GW flow and potentially limited dilution of contaminants at the points of abstraction for some PWS in particular.

- *'dilution would quickly reduce contaminant mass. In addition, contaminant path lengths to receptors are also considerable' -*
  Dilution in limited GW aquifers on this site is likely to be limited. The fact that DEHP was found in GW across the whole site would mean that generalised contamination of GW across the whole site could not be excluded. GW fracture flow may well have contributed to otherwise unexpectedly high levels of pollutants in areas unrelated to concurrent construction activity.

  Borehole WS08 is 1km from Moor Farm (which was inhabited at the time of WL WF construction 2006-2009). The highest DEHP recorded for this borehole was 590ug/l on 05//12/07. No PWS monitoring occurred at Moor Farm, or any other PWS, for any of the WLWF developments, therefore it is not possible to state what the concentration of contaminants might have been for water at untreated domestic points of consumption.

- *In conclusion, the presence of the reported DEHP in the WL catchment is not considered material to the WL3 the proposed planning submission. Potential risks are considered to be* ***Low:*** *It is considered unlikely that either DEHP is present (in sufficient concentration); or that significant harm is being caused (or will be caused) to one or more receptors by the mass identified.-*

  Apart from the measurement of total hydrocarbons, no monitoring for 'industrial contaminants' occurred at any PWS considered to be 'at risk' and

which were being monitored during windfarm construction. Ignoring the peaks of turbidity in PWS which are associated with construction, this lack of extended monitoring test parameters, less than that conducted routinely for surface and groundwaters, allowed SPR, competent authorities and the PMO to conclude that no construction related effects were seen impacting on PWS.i.e. This lack of testing for industrial contaminants in drinking water was a self fulfilling prophecy in that no contaminants were found.

No measurements were ever taken at sensitive receptors (PWS and Public water reservoirs) to determine the concentration of phthalates in drinking water and to know whether there was likely to be a risk to public health.

Dr Connor is of the view that without measurement for contaminants at the point of abstraction and consumption, the above statement by Dr Lee has no evidence base.

1.1.

- Scottish water were not informed of the GW monitoring results.
  This was contrary to standing arrangements (Environmental Pollution Incident Plan –EPIP) that SPR was to inform SW of any contamination events on the WL windfarm site **(CH 112)** which is in a statutory Drinking Water Protected Area .

1.2.

- There was **no testing** for DEHP in raw or potable water for Amlaird WTW 2006 -2013. **(CH 150, CH151)** . This may be because SW were not informed of the GW monitoring results.

  Apart from mention of DEHP in an early PMO Report 2,(included above) which was sent to competent authorities (in which the presence of DEHO was discounted because it was an isolated contaminant) , no other statutory authorities were notified of the persistent and increasing levels

of DEHP in groundwater.

16.3 Theories of 'False Positive' high DEHP results:

It was suggested at the PLI, that high levels of DEHP in GW could be due to 'iron mucilage' forming in the bore holes , as a result of the high iron concentrations in GW. It was suggested that this mucilage resulted in excessive leaching of DEHP from synthetic borehole casings.
Dr Connor has been unable to find any relevant research papers to support this hypothesis. However, there is literature regarding iron mucilage (derived from cactus plants) being used to reduce arsenic from drinking water!

It should be noted that Land – Drill Geotechics Ltd who installed boreholes WP01,WP02,WP03,WP04, , state that they normally use steel borehole casings**.(SPR -W022 – Notes on Field Procedures)** Detail of casings for boreholes WS119, WS59A, WS08, and CP02 installed earlier(2002) by another company, are not recorded. Steel borehole casings would not be expected to leach DEHP into GW and therefore the effect of 'iron mucilage' would be untenable in these boreholes. Despite the possible difference in casing composition, all the boreholes returned very high DEHP values. Thus the borehole casing material is felt to be an unlikely cause of a 'false positive' reading.

Monitoring boreholes WS119, WS08 and WS59A were removed by SPR in August 2007, May 2008, and August 2008 respectively. No explanation for their removal was given, although this would make it impossible to conduct further follow up GW monitoring at these boreholes.(Groundwater Quality Monitoring Interim report Jacobs July 2006-Sept 2008)

Not all boreholes functioned throughout the WLWF construction period. Of those

tested by Jacobs throughout development, including all WP boreholes, all tested positive for DEHP in GW, with levels exceeding at least 470ug/l and up to 3200ug/l. **(SPR-W022 Jacobs 2009)**

It was also suggested that the suction pump used to obtain GW samples may have caused a positive result for DEHP.
This seems unlikely, as the methodology used to obtain samples required that the well volume was purged three times to avoid spurious results from surface water contamination of the well and effects of well stagnation. This would also have effectively purged the pump equipment. Had the high DEHP levels been due to the pump oronnectingc piping it would have been expected that all results would have recorded a similarly high level on the same day, assuming the same equipment was used for all wells.

As a UK accredited laboratory, SAL Ltd, conducting the test analysis for SPR, would have provided the appropriate sample containers to avoid false positives from leaching of DEHP from inappropriate container material, thus the transport container was not likely to give rise to false positive results.

Because of the rising and excessively high mineral content (Iron, Manganese and Aluminium) at most of the boreholes across the site over the course of construction, the laboratory recorded that from February 2008, it used additional 45 micron filters, in addition to the normal practice os filtering samples at the well head..**(Groundwater Quality Monitoring Interim report Jacobs July 2006-Sept 2008).** There seems to be some confusion between the Jacobs reports and the laboratory results as to exactly when this additional filtration was introduced.

Thus a new methodology was introduced into the sampling regime, using double filtration, which throws doubt on the whole validity of interpretation of subsequent

mineral and some chemical results. The PMO also commented on the subsequent validity of results after this change in technique.
Certainly this produced a dramatic general reduction in mineral levels across all boreholes. **(SPR-W022 Jacobs 2009) Figure 4a,b**

DEHP has been described by Dr Lee as having particularly high cohesive properties, '*a soil sorption (KoC 4 to 5)',* this means that it tends to bind to particulate matter or other molecules, such as iron, carbon, silt or organic matter.
Thus additional micro filtration to remove metals, may also have removed adherent DEHP, producing subsequently falsely low readings.

DEHP Solubility: **(CH 038 European Union Risk Assessment Report BIS(2-ETHYLHEXYL) PHTHALATE (DEHP) CAS No: 117-81-7 EINECS No: 204-211-0 RISK ASSESSMENT** reports *''A large range of values on the water solubility is available in the literature (0.003-1.3 mg/l at 20-25°C) (see Table 1.1). A probable explanation of this is that DEHP easily forms more or less colloidal dispersions in water, which increase the amount DEHP in the water phase (Lundberg and Nilsson 1994)''* The dissolved solubility of DEHP is approximately 3ug/l, which is below the limit of detection in this laboratory.(LoD 10ug/L) As most of the high values of DEHP, above 3ug/l detected in groundwater would have been a colloid, this would have almost certainly have been removed by ultrafiltration.

This is important because if there was a series of spill events over a short time period reaching GW, for example spills of hydraulic oil containing DEHP, then it might be expected that DEHP would be adsorbed onto particulate matter in GW and descend within the aquifer, perhaps also becoming absorbed onto silt matter or clay, with potential to leach further into deeper groundwater over a longer period of time.
All borehole sampling involved only superficial sampling, no deeper than 7.2m (Borehole CP02). Thus it may be that results subsequently negative for DEHP in GW also occurred because of a failure to sample at greater depths where, for example,

domestic borehole abstraction would be more likely.(Greater than 15 -20m)

Whilst commercial confidentiality and the passage of time limits our ability to identify a likely source for DEHP on site, we do know that DEHP is and was used in a wide range of manufactured products including hydraulic oils.
We know from ECoW and PMO reports that there were a number of reported and unreported spill incidents related to hydraulic oils, other oils and the filling of turbines with various oils and antifreeze. (ECoW Report 7,12,14,24,25,26 and CH 01) p9 5.3)

SPR have failed to provide any credible explanation for why DEHP was found in such excessive quantities in groundwater and why this was attributed to 'laboratory or sample collection' error, without providing further evidence.

When DEHP was detected repeatedly, in significant and toxic quantities in GW over long periods, it was not investigated and no risk analysis or specific monitoring for private or public water consumers was conducted to determine whether adequate dilution or attenuation had occurred at the point of consumption.

No follow up groundwater monitoring results were obtained from the original WL WF site , as recommended by Jacobs Ltd **(SPR-W022, 8.5)** and, no GW monitoring results are available to us or EAC for WL WF Extension.
Therefore, it is not possible to know whether DEHP contamination persisted in deep groundwater or recurred with the construction of the windfarm extension.

16.4 DEHP Summary

As the source and cause of pollution with DEHP in GW remains unknown, but laboratory error seems unlikely in light of the new evidence, it appears that the mitigation procedures to prevent this and other contaminants reaching GW was ineffective.
Without understanding how the contamination occurred, it seems impossible to

design effective, prospective mitigation to prevent this happening again.

Domestic consumers of untreated ground water and the environment in general, would have been particularly vulnerable to contaminated GW which may again be adversely affected by WL3

The presence of DEHP in drinking water above 8ug/l is an unacceptable health hazard.

These conclusions should weigh heavily in the balance against this application.

16.5 Cement Constituents.

During the PLI, SPR presented new evidence **(SPR-W108)** to show that DEHP, widely used as a plasticiser, had not intentionally been used as a plasticiser within any of the cement foundations used for either WL WF or WL WF Extensions
This document **(SPR-W108)** records that Daracem 216, Mira 71 and CP105 were used as cement 'plasticisers', although it's not clear which chemical was used in cement for which windfarm. In a letter to Dr Lee 02/06/2015, it appears both Daracem 216 and Mira 71 were used.

Unfortunately, the data sheet for Daracem 216 states, *''ADDITIONAL ECOLOGICAL INFORMATION. General Notes: Water hazard Class 1 (German Regulations)(Self-assessment): slightly hazardous for water. Do not allow undiluted product or large quantities of it to reach groundwater, water course or sewage system''*
and for accidental spill, *''Inform respective authorities in case of seepage into water course or sewage system.''*
Unfortunately, no data sheet was supplied for Mira 71.

It would appear that for WLWF a plasticiser 'CP105'was used, which according to the supplier/manufacturer, meets requirements in respect of Water Company Regulation 31 2000, which requires that a declaration is obtained for all admixtures which may be in contact with drinking water.

It seems wholly unsuitable to use Daracem 216 in such large quantities where drinking water sources to numerous PWS had not been identified. It was also not stated if Scottish Water were consulted as to whether use of this product in large quantities, constituted a hazard next for drinking water reservoirs.

120,000 tons of cement were used in the construction of WLWF (data from East Renfrewshire web site: Development of Whitelee Windfarm[1].
It seems likely a similar quantity was used for the Whitelee Extensions.
There is no indication from information supplied by SPR that SEPA or SW were consulted regarding the use of Daracem 216 in large quantities on a DWPA.

We feel that the potential contamination of the water environment with chemicals likely to be in use during construction, operation and decommissioning should be properly addressed for WL3 with environmental agencies , given that once again, unidentified PWS water catchments are likely to be impacted by several thousand tons of cement.(approx. 450 cu m concrete per foundation)

16.6 Arsenic

During the course of the Public Inquiry, SPR submitted new documents **(SPR WO59)** a preconstruction groundwater and soil analysis for Whitelee WF Extensions in 2010. These test results show arsenic within GW at borehole WSSS2, in both October and December 2010, at 11ug/l; which is above WHO and UK drinking water guideline values of 10ug/l.
Soil samples also showed presence of arsenic up to 12.9ug/l at TP36 , although this is below the UK Environmental Quality Standard for soil.
Arsenic is categorised as a Group1 (most severe) carcinogen for humans by the World Health Organisation.

[1] http://www.eastrenfrewshire.gov.uk/whitelee-development

The source of arsenic on the Whitelee windfarm site:

We have no information whether any further investigation into the source of arsenic was conducted by SPR.

No heavy metal analysis was recorded for previous WLWF GW monitoring, so direct comparison with preceding GW results is not possible. This 1.42m shallow borehole is sited between turbines T106 and T17 of the original WLWF and close to the construction compound for WL Extension.(See map attached to SPR WO59 for borehole and soil sampling positions) The fact that this borehole is sited on the previous WLWF windfarm area is of concern for residual changes related to previous construction activity.

CHG suggests four possibilities for the presence of arsenic in groundwater:

1. The change in GW for WLWF became highly reductive during the course of previous Whitelee windfarm construction activity and the increased organic matter reaching groundwater, probably predominantly through excavations, caused decreased pH (acidity), and increase reduction and release of iron, manganese and aluminium from bedrock. This was, reflected in the increasingly high mineral content of groundwater. It is notable that there was a particularly high level of total organic carbon (TOC) also found in the same borehole. These reductive conditions will promote release of arsenic from bedrock, although Dr Carroll has advised us that the appearance of arsenic in GW under these conditions more typically tends to occur with sedimentary and mud rocks rather than volcanic basalts.
   Very few boreholes of significant depth were drilled for this survey (most were less than 1 metre), so comparable GW results from across the site are not available.
   The fact that arsenic was detected at a depth greater than would normally be found with soil contamination (described by Dr Lee at PLIas being not usually more than 20-30 cm depth), would favour an origin from GW.

2. It is possible that an unreported chemical spill related to previous windfarm construction activity has left residual arsenic in situ.

3. It is possible that there was residual arsenic left from historic previous pesticide/preservative use, for example from an old fence post – this might be expected to be at a shallower depth. There is no history of the Whitelee site being used for previous industrial activity or as a landfill site. The site of this borehole is distant from general public access roads or quarries, which would make 'fly tipping' contamination unlikely.

4. This borehole is located next to the chemical and control compound for WLWF and the detection of arsenic might have been related to chemical spill related to use or storage on the compound.

Unfortunately, no other previous GW laboratory results included arsenic as a test parameter on the WLWF site and so it is not possible to know whether this is an isolated contaminant or part of a wider problem.

As with the discovery of DEHP contaminating GW, a source cannot, at this late stage be determined easily, although further groundwater analysis across the site would be helpful, even at this late stage and certainly as part of the site investigation for WL3

Because of the sensitivity of this site as a public water catchment area, Dr Connor contacted Scottish Water (who were unaware of elevated arsenic in GW) and SW have confirmed there were no exceedances of arsenic in the potable public water supply from 2006 to 2013. However, this is of little comfort to neighbouring residents relying on untreated PWS, who will not have had their water screened for excess arsenic during this period.

16.7 Petrohydrocarbons:

SPR Sampling sites within Scottish Water's catchment area recorded generally high levels of total petro hydrocarbons in surface waters, (SPR W057) particularly noticeable in feed in waters to public reservoirs *Figure 9*. Four samples exceeded WHO Environmental Quality standards, regarded as being 300ug/L. compared to base line and post construction monitoring rounds. e.g.SW 05 (Dunwan reservoir) – 1740ug/l on 02/02/06, SW04 (Lochgoin) 417ug/l on 01/05/06,

This is of particular concern as these results include those surface waters feeding directly into public water reservoirs fromareas involved with construction or forestry activity. Many samples recorded long chain (aliphatic) hydrocarbons; usually associated with fuel contamination or by products. ..

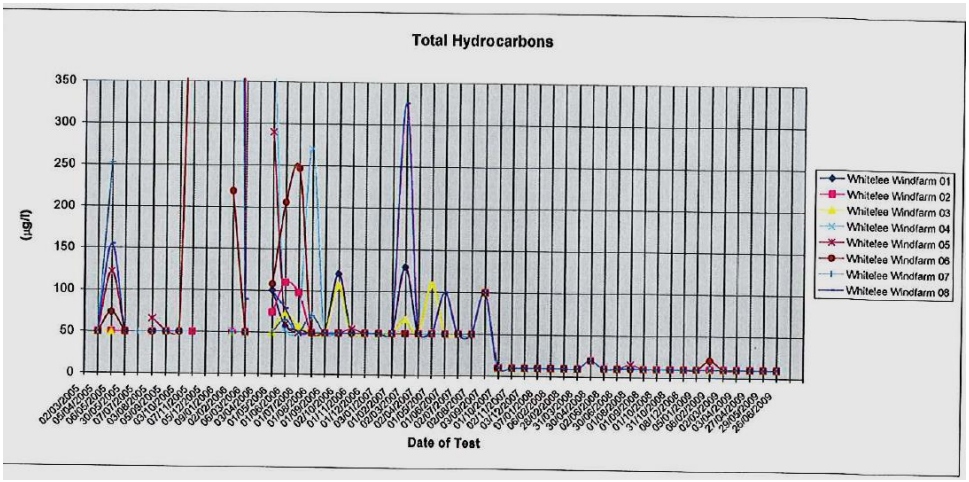


Figure 9 - Total Hydrocarbons within surface water of SW catchment areas.(from SPR-W057

(A Map of SW sample points is present in Planning Condition 7.1 **CH 159**

From **(SPR WO59);** high levels of aromatic hydrocarbons (267 ng/L)were also consistently detected in surface water (SW) monitoring point SW3 during October and November 2010, compared to all other monitoring points .

Aromatic hydrocarbons, which include benzene derivatives, are of concern as known carcinogens. Aromatic hydrocarbons are found in petrohydrocarbons and pesticides as well as occasionally occurring naturally.

SW3 is at Bowhill burn, a tributary of the R. Irvine.

(This sampling point is downstream of High Bowhill Farm and it is possible, that the contamination may have been related to activities on that site).

16.8 Minerals:

Very high mineral levels in GW developed over the course of WLWF construction, compared with normal baseline environmental and drinking water quality standards (EQS and DWS).

Aluminium: Notably, peak aluminium levels (prior to the inclusion of additional laboratory filtration) occurred up to 27 mg/ml recorded in 2007, 135 times drinking water standards of 0.2 mg/l. (This excludes an outlier value of 270 mg/ml, felt to be an erroneous level -? explanation for this) Baseline aluminium (as well as magnesium, calcium,sodium and chloride)levels were specifically commented upon by Jacobs as being 'well below the respective Environmental and Drinking water quality standards in all four boreholes.
(**Groundwater Quality Monitoring Initial report July 2006-Aug 2006, Jacobs Babtie, Sept 2006 CH 156 p 3.para 3, 4.1.**)

The 2010 preconstruction WLWF Extension GW samples **(SPR W059)** from a number of boreholes recorded very high levels of aluminium in superficial GW (e.g. Borehole WSSS2 63 mg/l, 146 – 26.0 mg/l , 165 – 67mg/l)
This suggests that the mineral changes in GW which developed during WLWF construction 2006-2009, persisted into 2010.

Iron: Base line monitoring GW results from July 2006 also demonstrated normal baseline EQS and DWS iron levels in two out of four boreholes, with the highest level at borehole WS08 nearest the WL3 site) recorded at 6.42 mg/l. (DWS 0.2 mg/l)
It is notable that peak of iron within GW at borehole WS119 reached 50 mg/l during construction of WLWF in 2008.(250 times drinking water standards)
The 2010 WLWF Extension preconstruction results **(SPR WO59);** also showed high

iron levels in October 2010 GW for borehole WSSS2 -22mg/l. (This WSSS2 borehole also recorded the high arsenic levels)

High aluminium in groundwater is known to occur, along with other minerals such as iron, manganese and arsenic, when there are highly reductive conditions in anaerobic groundwater with a low pH **(p 38,Box 15. Groundwater and its susceptibility to degradation. CH 37)** Decreasing pH over the course of GW monitoring at WL WF is shown in Fig 6.
The change in mineral composition of groundwater is discussed in more detail in our 'Water Evidence' (**309, CH 149)**

However, although CHG has not been able to obtain the required follow up GW monitoring results for the WL WF Extensions, these few <u>preconstruction</u> results of shallow GW in 2010, suggests that there were continued GW mineral changes, potentially occurring as a result of the original windfarm construction. Unfortunately, the lack of GW data for WL WF Extensions precludes a more informed opinion.

16.9 <u>Phenols and Chlorinated Phenols</u>

Baseline borehole GW monitoring at WLWF showed no evidence of volatile or semivolatile organic compounds.(**Groundwater Quality Monitoring Initial report July 2006-Aug 2006, Jacobs Babtie, Sept 2006 (CH 156) p4 para 2**)

Phenols, chlorinated phenols and plasticisers were subsequently detected in a number of monitoring rounds.
Jacobs Ltd attributed the detection of these compounds to laboratory error: ***4.16*** *'It is thought most likely that the detection of these compounds has been caused by cross contamination in the laboratory and that the contaminants are not considered to be present on the site'* **(Groundwater Quality Monitoring Interim report. Jacobs**

July 2006-Sept 2008)

Likewise the presence of toluene and chloroform in groundwater were attributed to laboratory error.

3,4 Methylphenols were found up to **180ug/l**, in October 2007 in WP01,(**SPR W022**) which is above the environmental quality standard for phenol at 30ug/l (No quality standard exists for 3,4 methylphenol in drinking water).
Chlorinated phenols, eg trichlorophenol a banned substance in the USA, was also detected at WP01 (but at levels below WHO drinking water guideline limits).
Chlorinated phenols are of particular concern due to their carcinogenic potential and environmental persistence.
The presence of 3/4 methylphenol was described by Dr Lee as being potentially related to peat degradation products, particularly from peat burning. Ms St Martin (Jacobs Ltd) described a verbal encounter with an unnamed Scottish Water representative on site who thought perhaps there had been peat burning on the site. Mr Hugh Hendry (a third party objector to WL3) has walked regularly over Whitelee for over 50 years and has never seen any peat burning.

It is of note that WP01, the borehole sited between the two public reservoirs, has the lowest depth of peat of all the boreholes on the WLWF site and yet this borehole had the highest concentration of a variety of synthetic chemical contaminants, (including 3,4 methylphenol), which were **not found at any other borehole**.

It seems an unreasonable conclusion that one borehole would have a normal baseline screen and then develop persistently high levels of chemical contamination with a number of synthetic chemical compounds, some with significant toxicity, occurring from September 2007 until the end of monitoring in 2009 and that this could be attributed to laboratory error without supporting evidence.

The probability that samples testing positive for a wide range of synthetic chemicals, from the same borehole, out of all the GW samples, could be subject to a consistent laboratory error over two consecutive months in 2008, from an accredited laboratory seems unlikely.
This concentration of synthetic chemicals, would lead a reasonable person to question and investigate whether there had been an unreported chemical spill in the area and to take additional soil and water samples.

SPR had clear arrangements to inform Scottish Water(SW) of any contamination event on SW public water catchment.**(CH 021)** That the borehole WP01 is nearest to the public reservoirs of Craigendunton and Lochgoin and the monitoring results were still not communicated to SW is of great concern.
The same concerns are held for the failure of SPR to notify SW of the exceptionally high and persistent levels of DEHP in GW from across the site.

Review of raw and potable water monitoring results for Amlaird from 2006 -2009 (CH 150, CH 151) reveals **that SW did not monitor for levels of DEHP or other phthalates at any time and monitoring for methylphenols stopped in March 2008**, There was no monitoring of reservoir raw water, or potable water for six months between August 2007 to March 2008, at the time of a peak of Methyl phenol at 180ug/l in October 2007)

Dr Lee pointed out that public reservoirs hold a large body of water which is likely to dilute any contaminant. This may not be the case for PWS,which were dependent on aquifers with limited capacity for dilution..
It is not possible for SPR to provide reassurance to those households dependent on groundwater from the Whitelee site that their water supplies were not contaminated by various synthetic chemicals and high minerals during WLWF construction.

Whilst dilution of a contaminant in a reservoir may provide natural attenuation for a public water supply, the legislative principle remains that raw water for drinking should not be contaminated. This ethos is endorsed by the Scottish, and UK Governments and framed in legislation by the EU (see previous section on Legislation and the WFD).

What is of concern here is not just that numerous monitoring results for previous WLWF developments were clearly abnormal, but that there was and apparently still is, a culture by SPR and their agents, of attributing every abnormal result to laboratory error, rather than investigating the cause of documented pollution of groundwater on a protected public and private drinking water catchment area.

How does this concern WL3?

- Rigorous monitoring of surface and groundwaters must be included in planning conditions for WL3, if consent is granted.
- Monitoring alone is not mitigation and is meaningless, unless abnormal results are properly investigated.
- The practice where every abnormal result is attributed to laboratory error and not communicated to competent or responsible authorities is totally irresponsible and unacceptable. Monitoring results must be made publicly available and there requires to be independent scrutiny of monitoring results which should be automatically sent to SEPA for review.
- Without understanding the source and mechanism for the appearance of chemicals appearing in groundwater during the construction of WL WF, it is not possible to devise adequate protection or mitigation measures to prevent repeated, potentially cumulative contamination of the same body of groundwater during construction of WL3..

17 Site Specific Geology

Detail regarding the 2002 BGS Map 22E and impact on private water supplies – Matter 1, was submitted to DPEA on 06/07/15 and a response to the report by Dr. Lee, Consultant Geohydrologist for SPR submitted on 22/07/15.
We do not intend to repeat the content of those submissions here, although summary points are included.

For Environmental Statements and PWS risk assessments submitted to Scottish Ministers, Competent authorities, Statutory bodies and the Public, SPR have consistently submitted out of date geological maps for WLWF (2003 and 2006), WL Extensions(2010) and for this WL3 Extension(2012).

In his submission to DPEA of 23/07/15, Mr Innes for SPR points out that there is an up to date 2002 BGS Survey Map 22E 1:10,000 extract, included as Figure 5 within Technical Appendix 9.1: Peat Landslide Hazard and Risk Assessment.
In the WL3 ES Technical Appendix 9.1, *Figure 4* is an 'Extract from 1:63,360 Kilmarnock Solid Geology Map Sheet 22'. This is the same 1928 map used within Geology Chapter 9 in the main ES.
Figure 5 in Technical Appendix 9.1 is an extract from this 2002 Map 1:10,000 with solid and drift maps combined and overlain with peat deposits, rather than the solid bedrock geology as depicted in the current 2002 BGS Map 22E. (Figure 5 from Appendix 9.1 has been depicted here below as Figure 10.) This combined solid and drift map with superimposed peat deposits detracts from the significance of the geological fault lines running into the middle of the WL3 site. (Figure 11)

Figure 5. Appears to be the only current 2002 BGS Map from the WL3 EIA(located in the Appendix) which demonstrates the geological fault lines on the site.

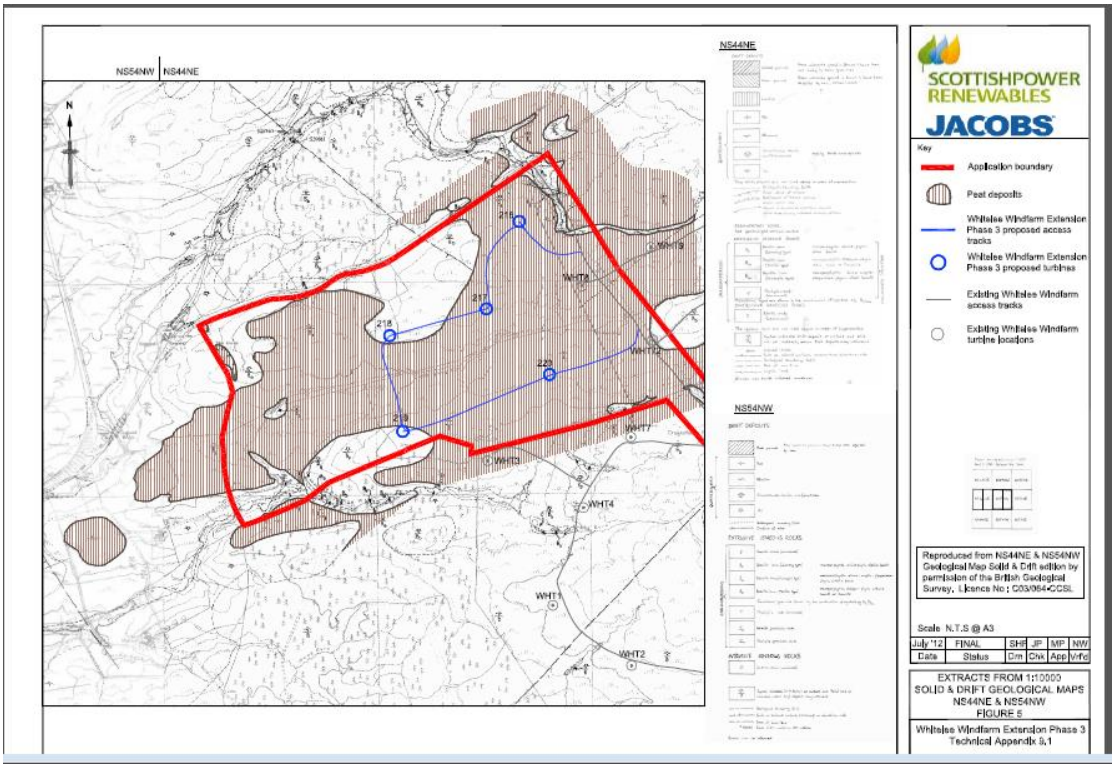


Figure 10 - Taken from WL3 Technical Appendix 9.1: Peat Landslide Hazard and Risk Assessment Figure 5

CHG was unable to find any reference to Technical Appendix 9.1, Fig 5, within the body of the text of WL3 Chapter 9 on Geology. It is felt that it would be confusing for a member of the public to be expected to look in a section on peat landslide, to find the only up to date solid geology map which depicts the fault lines on the WL3 site. As printed in the Appendix in Fig. 5, the Legend is also illegible.

The solid geology maps submitted for Whitelee windfarm, WL WF Extension ES and WL 3 ES (Geology Chapter) are pre world war two, dating from 1928. The more recent 2002 map is a significant departure from the 1928 edition. This 2002 version depicts multiple faults throughout the Whitelee plateau involving the otherwise low permeability basaltic bedrock. In previous ES, in combination with the overlying glacial till (clay) depicted on BGS maps of superficial deposits, this 'unfractured'

bedrock was construed by SPR's experts as providing an impermeable protective layer, shielding groundwater from any surface pollution that might occur as a result of windfarm construction. As for WL3, this ignores the obvious, which is that any low permeability peat and clay is removed over areas of quarry or turbine foundation excavation.

The failure to submit contemporaneous maps within previous WF applications, may well have misled Scottish Ministers into believing that there was no, or negligible risk to GW and PWS from previous windfarm construction and operation, when the reality, as revealed in GW monitoring results, was very different.

Not only should the understanding of the more fractured bedrock (*Figure 11*) have changed the previous risk rating with respect to groundwater pollution from surface activities, but this should have changed, or influenced the previous siting of quarries, turbine foundations and chemical storage compounds to reduce the potential risk to GW aquifers and PWS.

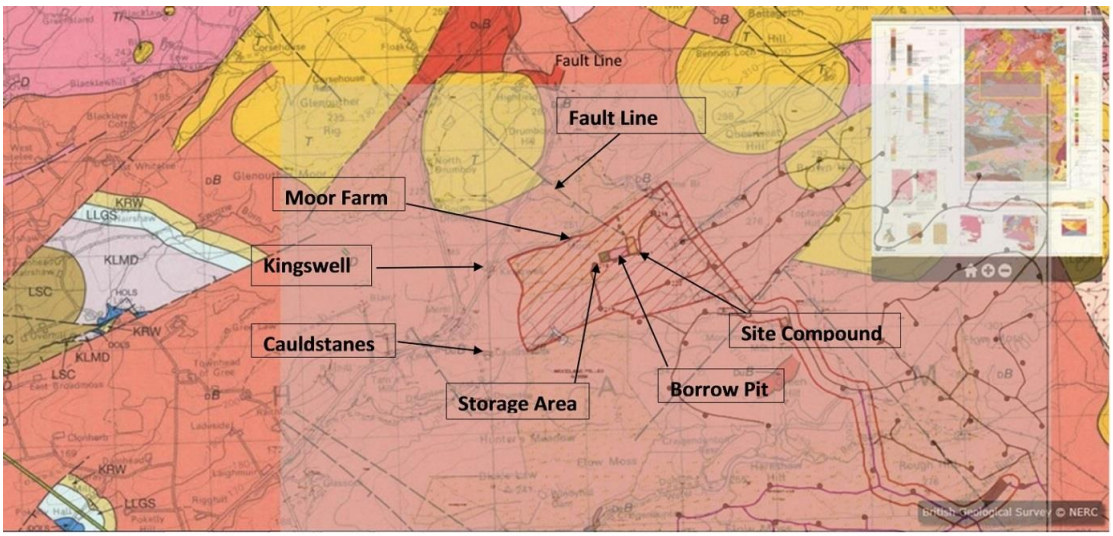


Figure 11 - The WL3 development site superimposed on extract of 2002 BGS map 22E by the CH group.(CH 155)

CHG's post Inquiry comment – **CH group 06/07/15**, regarding the 2002 BGS map 22E, examines the potential contribution of the geology of the Whitelee site to the recent deterioration in quality and quantity of several neighbouring PWS in more

detail and attempts to provide information on the influence of local geology in influencing risk to PWS from the construction of WL3 WF.

CHG's comments draw on the monitoring results of PWS surrounding the WLWF site conducted by SPR over seven years. It is the opinion of CHG that these geological fracture faults may have allowed more rapid GW flow and less dilution of contaminants than would have been predicted using modelling based on the 1928 BGS maps previously submitted by SPR and that these factors contributed to the observed effects of contamination of GW dependent PWS,often at a distance from active construction or excavation

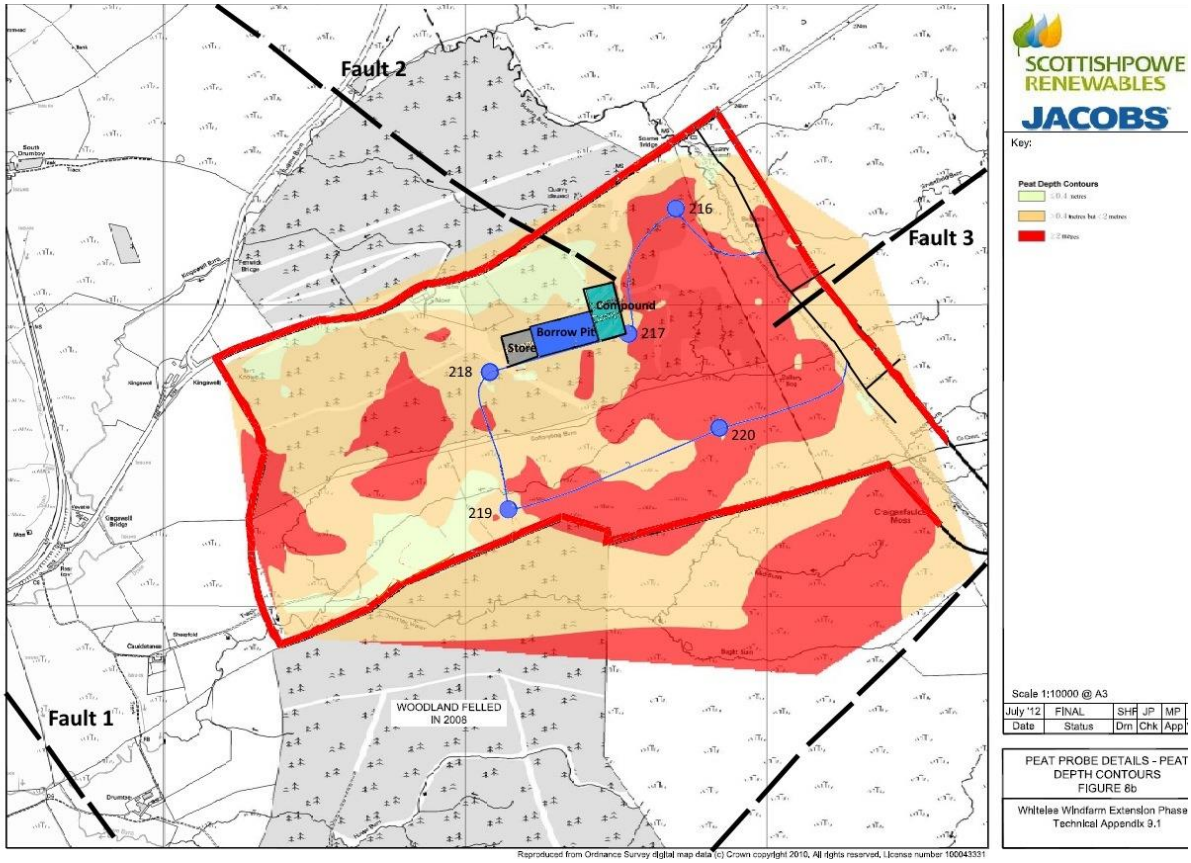


Figure 12 - Relationship between construction activities and Fault Lines

Figure 12 . CHG has superimposed the proposed turbine layout, construction compound, quarry and store (oil and other chemicals) to the charted faults from the

2002 BGS 22E Map (as numbered by SPR in BGS map submission from Dr Lee, 11/07/15) and superimposed on areas of deep peat .(red >2metres)

Groundwater flow and Aquifers.

Dr Lee refers to ''*The fundamental law of fluid flow through porous media, D'Arcy's Law, indicates that subsurface fluid flow is controlled by a combination of rock permeability and the hydraulic gradient within the rock mass''****(Matter 1,08/07/15 BGS Comment Ch. 2. Para 1)***

Increased groundwater flow (hydraulic conductivity) is recognised in bedrock fractures, known to be present on the Whitelee site and this UN sponsored reference document also refers to Darcy's Law. **(CH 37 BGS, U. a. (2003). Groundwater_and its susceptibility to degradation p12 para 2):**

''*In contrast the storage in even highly fractured aquifers is much smaller, and typically does not exceed a few per cent.* ***Thus, the volume of water available for dilution is much smaller****. Moreover, the aperture range and degree of interconnection control the availability of the water and the speed with which it flows.* ***Groundwater velocities can be much higher, and may be measured in <u>km/day</u> in some limestone and volcanic lava aquifers,*** *but are also much more variable. It is also technically much more difficult to characterise the fracture density and pattern. This makes for uncertainty in productivity forecasts, in the prediction of the rate and extent of contaminant plume migration, and in the extent to which remediation techniques can be effective.''* (BGH emphasis)

This underlying rock structure means that at Whitelee, the rate of flow of groundwater within fractures, confined to these limited aquifers, is likely to be much faster than in the superficial peat layer. (*Figure 13*)

Dr Carroll, consultant geohydrologist, has also stated that he regards the hydraulic conductivity within such fractures as likely to be closer to that of flow in sandy till or silty sand.

The importance of increased hydraulic conductivity is in the increased survival of pathogens within groundwater. E. Coli and most pathogenic bacteria have a life expectancy in temperate climates of 4 weeks, although viruses, e.g. hepatitis, will live longer:

> *'In groundwater, some viruses are known to survive for up to 150 days and encysted protozoa even longer. In the case of indicator bacteria (microbes commonly associated with pathogens but more easily incubated and identified), a half-life in low-temperature groundwater can be as high as 22 days, with survival of appreciable numbers up to 32 days'(***CH 37 BGS, U. a. (2003). Groundwater_and its susceptibility to degradation p7 para 2)**

This may help to explain how this site specific geology contributed towards potential contamination of PWS, apparently at some distance from construction activity, on the previous WL WF sites. (CHG Matter 1 DPEA submission 06/07/15)

SPR have acknowledged the risks to groundwater and public and private water supplies in their Environmental Statement for WL3:

> ***9.5.2.2.2 Groundwater and Water Supplies***
>
> *68. Windfarms are generally located on higher ground over areas that are often groundwater recharge zones. Construction activities may require or result in dewatering of shallow groundwater, which may reduce theoverall groundwater recharge and affect the yield of private water supplies.*
>
> *69. Excavation of material will be required for the foundations of the turbines. While these excavations are open, without mitigation in place they may*

present preferential pathways for any pollution incident on the surface to reach the bedrock aquifers (increasing vulnerability of groundwater to general contamination).

This in turn, could have an adverse effect on the quality of the groundwater abstracted in nearby private water supplies.

70. Borrow pits thus represent locations where the unsaturated zones of the bedrock will be exposed and there will be a higher risk of any potential pollution incident to reach bedrock aquifers. A pollutant may move through the fractures or fissures of the bedrock and could impact downstream on existing private water supplies which are sourced by the bedrock aquifers.

71. The presence of a number of materials used during construction and operation (e.g. fuels, oils, and lime) creates a potential source of pollution. Without pollution avoidance and control measures, incidents could occur and have an adverse effect on both shallow and deep groundwater sourcing private or public watersupplies.

9.8.3.1

126. During construction there is the potential for a range of contaminants to enter groundwater through runoff or accidental spillage. Given the potentially locally limited thickness of glacial till and peat deposits above the Carboniferous strata aquifer, excavation during the turbine foundation construction could cause potential pollutants to migrate vertically and have an adverse affect on aquifers.

During the operational phase and decommissioning phase, the turbine bases remain an area of altered groundwater flows and provide a potential conduit for surface water to more readily enter groundwater. **9.8 (116)**

There is a recognition that some windfarm activities are considered to be high risk for contamination. Blasting, excavation, HGV movements, construction and concrete pouring, with adjacent chemical, oil storage and sanitation facilities will be sited on or adjacent to high vulnerability fractured bedrock with potential access of pollution to more distant water supplies.

The multiple holes in overlying superficial geological deposits from the quarry and turbine foundations, are analogous to a 'tea bag', where there are multiple opportunities for surface water contaminants to reach groundwater.

The overlying superficial deposits have been regarded by SPR (Dr Lee) as having an impermeable, protective role for the vulnerable, underlying fractured bedrock, but in excavating quarries and turbine foundations, any protection afforded by a layer of overlying, low permeability deep peat (catotelm) and glacial till above the fractured bedrock will be removed.

Dr Lee conceded in his report that the lack of site investigation and test boreholes does not allow quantification of the thickness of glacial till; **(Matter 1 response 08/07/15 p4 para 8**)
Till has been described as having '*potentially locally limited* thickness' **(WL3 ES 9.8.3.1)** and combined with limited peat thickness mapped over much of the site, (WL 3 Technical Appendix 4.3 Figure 1.) this may well leave very little overlying 'impermeable superficial deposits' to protect vulnerable bedrock and underlying aquifers from accidental spill or pollution**.**

The lack of site specific geological information (e.g.from test bore holes) has been commented upon by Dr O'Dochartaigh BGS.**(CH 35)** as to why BGS would be unable to provide a PWS groundwater risk assessment on this site.

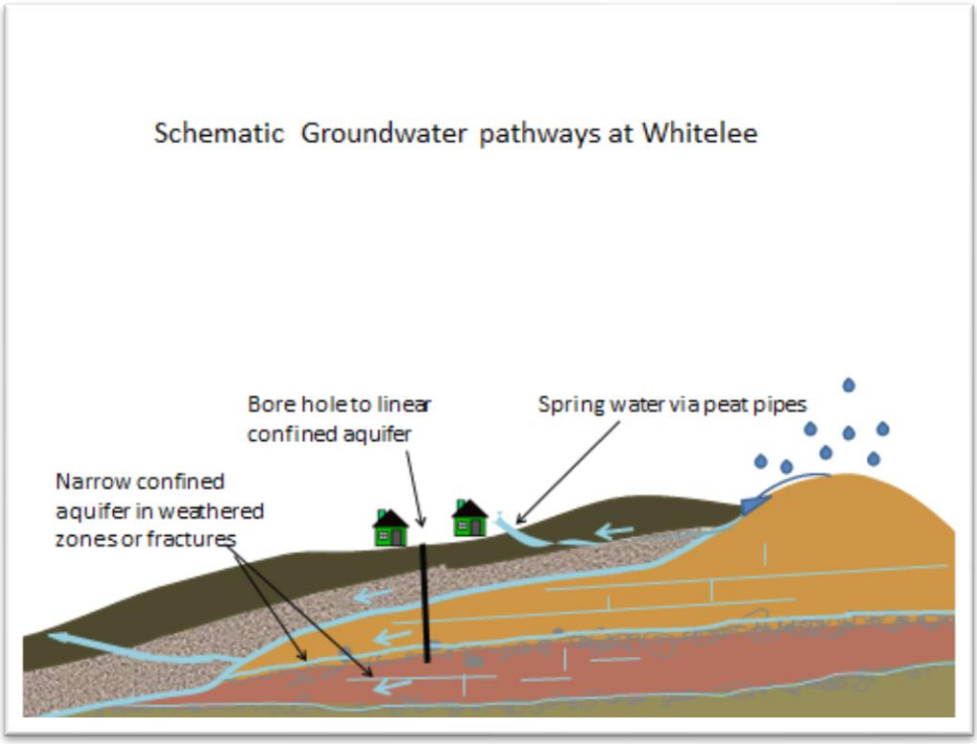


Figure 13 - Schematic Groundwater flows and aquifers on the Whitelee site

18 Risk to PWS: The Source-Pathway-Receptor model

Private water supplies, supplying potentially untreated drinking water to humans, are highly sensitive receptors in the vicinity of WL3.

Documentation from the previous WL WF and its extensions show serious adverse change in quality and quantity of domestic water supplies **(CH 149 – The Water Evidence. Ch 5. p 89),** despite employment of best mitigation practices, which SPR intends to implement on this site.

The 'source-pathway-receptor' model, underpins conventional hydrological risk

assessments.

Dr Lee has stated , *''It is reiterated that for a risk to be present, a plausible linkage between an identified Source, Pathway and Receptor must be demonstrated; without a plausible pollutant linkage there is no significant risk – even where contamination is present''*

Using this accepted model, CHG propose a more realistic classification of risk to PWS on the WL3 site based on our interpretation of information to date:

Source = Major construction, excavation, forest felling and earthmoving plant. Refuelling activities, Oil and chemical storage. Sanitation facility and proposed long term construction compound with sanitation facility ? septic tank. Designated: **High risk for pollution**:

Pathway = **Lack of actual geological evidence requires a precautionary assessment:** Potential high vulnerability to pollution (Scale 4/5 –SEPA groundwater vulnerability classification status, for denuded and exposed volcanic bedrock with fractures and intergranular fill potentially allowing rapid GW flows. (Figure 13)

No unsaturated zone in areas of excavation.)

(NB. SEPA GW vulnerability classification of 4b to 4d at adjacent Sneddon Law WF with the same basic underlying geology.CH 114 p2,)

Unquantified local fracture faults with potential for preferential GW flows.

Designated - **Probable High risk geology and GW vulnerability**

Receptor = **High** sensitivity drinking water supplies. Unknown/Unmapped water sources requires a precautionary approach.

PWS Overall Risk Assessment = High

18.1 <u>Geohydrology Summary Points</u>

1. The 2002 edition of the relevant geological map has been readily available for professionals and the public for 13 years. A 2002 BGS solid geological map of the development area has not been included in the main volumes of WL3 ES.

2. BGS Maps are only indicative of the extent and width of existing fault zones. They do not depict reality at a local site level.

3. In the absence of test boreholes, there is insufficient information to provide a prospective groundwater risk assessment.

4. It seems likely that the extent of interconnecting fractures and interconnecting groundwater flow in bedrock has been underestimated, based on the available evidence.

5. The fractures within bedrock and thin layers of gravel/sedimentary rocks between the layers of otherwise impermeable volcanic basalt (S.Carroll CH 106,1.2) are likely to provide limited aquifers for domestic abstraction.

6. Groundwater flows within fractures and faults cannot be predicted on this site in the absence of evidential geological information e.g. from test boreholes. However, it has the potential to be rapid, with bulk hydraulic conductivity comparable to that seen in sandy till or silty sand.

7. A thin unsaturated zone, with groundwater close to the surface, the removal of peat and clay over areas of excavation , the limited bedrock aquifers and rapid fracture flow hydraulic conductivity, increase the risk of persistence of contaminants in groundwater and the likelihood of contaminated groundwater reaching PWS. (*Figure 14*)

8. The effect of transmission of potentially polluted surface to groundwater in areas of peat deposits has been underestimated by ignoring the presence of 'peat pipes'.

9. Any protective effect of superficial soil and low permeability deep peat and clay(glacial till) will be lost in the areas of excavation with the highest risk for pollution, by exposing and excavating potentially fractured bedrock. (**Figure 14**)

10. Water sources and PWS catchment areas on the WL3 site have not been mapped. Combined with lack of physical and evidential geohydrological information, an informed risk assessment for PWS resulting from predicted impacts of constructing WL3 is not possible.

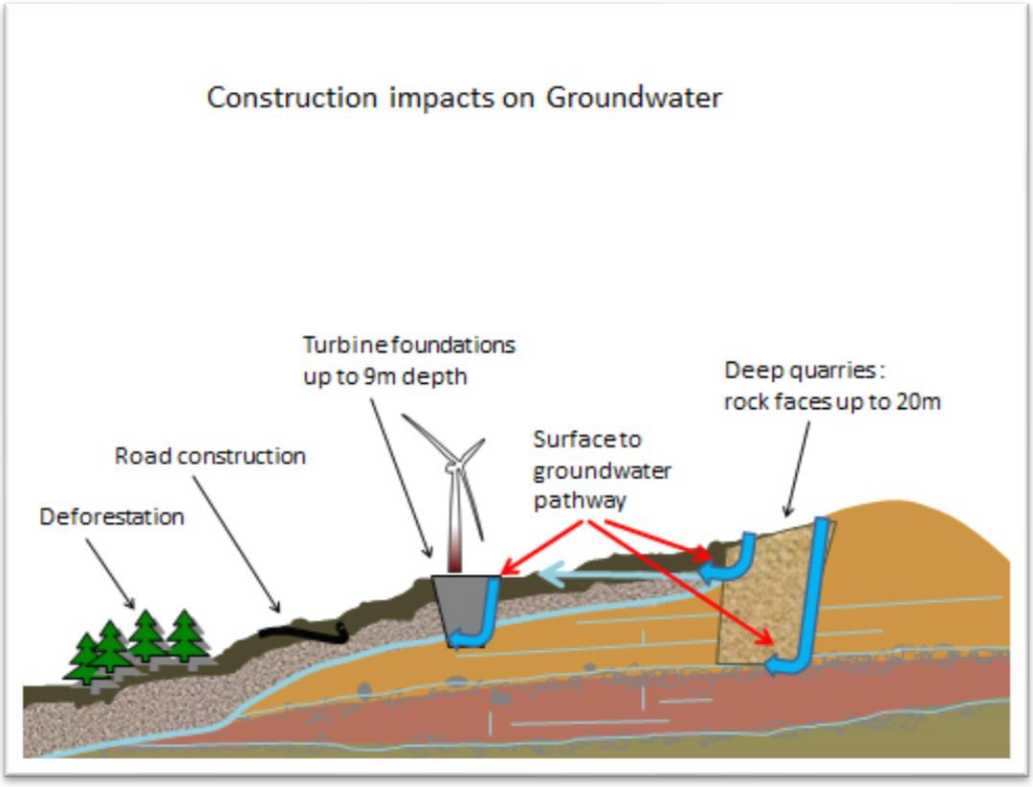


Figure 14 - Mechanism of pollution sources and pathways in windfarm construction on the Whitelee site.

19 Conclusions

CGH provide a summary of points taken from 1) Legal And Evidential Submission For The Protect Our Water Group (POW), 2)The Water Evidence Inquiry Statement ,3)CGH Comment on Matter 1, regarding 2002 BGS Map 22E and potential impacts on PWS, 4) Comment on Dr Lee's Submission regarding 2002 BGS Map 22E and potential impacts on PWS.

We wish these preceding submissions to be taken into consideration as the evidence underpinning our conclusions.

1. **Legislation:** The results of monitoring for previous Whitelee windfarm developments indicate that there has been failure to comply with the terms of

   1.1 The Water Framework Directive (DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT)

   1.2 The Åarhus Convention

   1.3 The Water Environment (Drinking Water Protected Areas)(Scotland) Order 2013

   1.4 The Local Development Plan

   1.5 Local Planning Policy (ENV24-protection of the Water Environment).

2. **Private water supplies:** Previous Whitelee windfarm has coincided with and probably contributed to:

   2.1. Complete loss of spring water supplies to four households.

   2.2. Three households requiring to install boreholes to reinstate supplies

   2.3. Documented gross bacterial contamination and siltation problems in numerous PWS. (WLWF and WLWF Extensions)

3. **Public water supplies:** Previous Whitelee windfarm and Whitelee windfarm Extensions 1 and 2 developments have coincided with:

   3.1. Documented deterioration in raw water quality feeding into public water reservoirs

   3.2. Documented deterioration in raw water quality of public reservoirs

   3.3. Documented failures of potable public water to reach drinking water standards during the construction of both windfarms, 2006-2012.

   3.4. Documented increased requirements by the Amlaird WTW for the treatment of raw water from public reservoirs on the Whitelee windfarm site during periods of windfarm construction.

   3.5. Scottish Water investing in remedial engineering works to address and exclude particularly poor surface water feed into Craigendunton reservoir

from St Mary's Loch and the Whitelee windfarm Extension catchment.(completed 2012)

3.6. Scottish Water committing to abandon provision of raw water for 34,000 consumers from Lochgoin and Craigendunton reservoirs on the Whitelee windfarm site, by building a pipeline to supply consumers with alternative water from Loch Katrine (North of Glasgow). (Due for completion 2017)

4. **Surface waters**:

4.1. SEPA has documented deterioration in overall status of two water bodies (Hareshawmuir and Craufurdland waters) emanating from the Whitelee plateau during the construction of Whitelee windfarm, contrary to the terms of the Water Framework Directive

4.2. Three of the River Irvine tributaries arising from the Whitelee plateau have been designated by SEPA as having 'poor' overall status (as of 2013), but with 'good' status required under the terms of the Water Framework Directive by December 2015.

4.3. There was documented increased phosphate and carbon run off related to deforestation and windfarm related activity for WLWF and WL WF Extension in surface waters from the site lasting up to two years.

4.4. Higher than seasonal average peaks of bacteria , petrohydrocarbons, minerals, colour and silt in surface waters were recorded, affecting Scottish Water monitoring sites flowing into public reservoirs, documented in monitoring results from 2005 (prior to windfarm construction), and reported by the Planning Monitoring Officer(PMO) for WLWF.

4.5. Monitoring reports from the Ecological Clerk of Works (ECoW) and PMO, recorded gross siltation and high minerals in other surface waters both within and outwith the WLWF development site.

5. **Groundwater** : For Whitelee Windfarm:

5.1. Groundwater monitoring results (from a baseline in July 2006) demonstrated the appearance of significant quantities of potentially toxic, semi volatile synthetic chemicals at all boreholes for WLWF.

5.2. Groundwater monitoring results from July 2006 recorded a marked increase in mineral content and adverse change in groundwater chemistry across the site.

5.3. SPR apparently failed to investigate any abnormal groundwater laboratory results which might have indicated the occurrence of a serious contamination event, or the cause of deteriorating groundwater quality within a DWPA.

5.4. SPR failed to inform competent or statutory authorities of monitoring results so that appropriate monitoring and mitigation of public and private water supplies could be arranged.

5.5. SPR failed to inform the Scottish Ministers , prior to consent being awarded for Whitelee windfarm Extensions , that adverse changes had occurred involving PWS, groundwater(and surface waters) on the WL WF site.

5.6. SPR failed to implement recommendations by Jacobs Ltd to continue groundwater monitoring on the WLWF site or, as recommended, to review the predictions that were made in the Environmental Impact Assessment for WLWF.

5.7. SPR failed to provide any groundwater monitoring data for Whitelee windfarm Extension, which includes 32 turbines on a public water catchment area.

5.8. SPR failed to investigate, or to notify to authorities, the persistent identification in 2010, of arsenic in groundwater (above levels for drinking water standards), which was related to the original WLWF site and found near WL WF turbines and a construction compound.

5.9. SPR has used cement plasticisers in large quantities, which have data sheet warnings against use in a water environment (the effect is unknown to us)

6. **Planning Conditions**:
   6.1. SPR has failed to comply with planning conditions to either provide appropriate information to affected householders with PWS, or to notify householders when PWS quality monitoring failed to meet drinking water quality standards.
   6.2. SPR has failed to notify competent authorities of PWS monitoring results.
   6.3. SPR has failed to provide East Ayrshire Council with groundwater monitoring results for Whitelee windfarm Extensions 1 and 2.
   6.4. No PMO was employed for Whitelee WF Extension construction and compliance with other planning conditions on the site is unknown.

7. **Scottish Water**:
   7.1. SPR failed to notify Scottish Water (SW) of all contamination events on public water catchment under terms of the agreed Environmental Pollution Incident Plan.
   7.2. SW has publically acknowledged the harmful effects of constructing windfarms on water catchment areas .
   7.3. SW has acknowledged that the operational phase of windfarms carries continued risks to the hydrological environment by virtue of the large quantities of oil and antifreeze stored within turbine nacelles (which require regular change,servicing and replenishing)

8. **Environmental Statements and Risk Assessments**:
   8.1. SPR failed to submit accurate, contemporaneous and complete Environmental Statements and private water supply risk assessments for previous Whitelee windfarm and WL WF Extensions 1 and 2.
   8.2. SPR failed to acknowledge that the PWS risk assessments conducted for Whitelee windfarm were inappropriate and inaccurate, but adopted the same inaccuracies in risk classification for Whitelee Extension 1 and 2.

8.3. SPR apparently failed to provide a comprehensive geohydrology risk assessment, which would inform impacts on groundwater dependent ecological systems particularly GW dependent PWS for Environmental Statements or for detailed post consent investigations, for either Whitelee windfarm or WL WF Extensions 1 and 2. Geohydrological assessment was not based on evidential and current BGS map based understanding of geology and groundwater flow on the Whitelee windfarm site.

9. **Community Benefit**:

9.1. Contrary to Scottish Government recommendations, the development of Whitelee windfarm and WL WF Extensions 1 and 2 have provided no community benefit at all to the nearest affected communities along the Hareshawmuir valley and to Moscow and Waterside villages.

9.2. Three historic farmsteadings have been lost to windfarm developers solely along the Hareshawmuir valley, to the detriment and viability of that small local community.(Other farmsteads have also been lost to the Whitelee windfarm development)

9.3. Residents adjacent to Whitelee windfarm and WL WF Extensions 1 and 2 already experience overwhelming visual impact and noise nuisance.
The Local Authority is currently conducting a long term study to address statutory noise nuisance.

9.4. There is documented substantial reduction in property prices for properties along the Hareshawmuir road, directly related to the proximity and the overwhelming visual impact of the Whitelee windfarm Extension 140 metre turbines.

19.1

19.2 <u>The Relevance of the history of preceding Whitelee windfarms to the proposed Whitelee Extension 3 windfarm:</u>

1. **Environmental Statement**:
   1.1. With respect to Private Water supplies and Geohydrology, the Environmental Statement for Whitelee 3 Extension is incomplete and inaccurate, contrary to the Åarhus Convention.
   1.2. Private Water Supplies (PWS) nearest the development site have not been either listed or charted on appropriate maps, contrary to requirements set out by SEPA.
   1.3. PWS water sources have not been identified, contrary to requirements set out by SEPA as a statutory consultee to windfarm planning applications.
   1.4. Within section 9. of the WL3 ES, (Geology), there is no reference or consideration of contemporary 2002British Geological Survey maps which include important information with regard to geological fracture faults on the WL3 site, not included on the 1928 maps submitted by the applicant in the Geology section of the ES.
   1.5. No geohydrological survey or risk assessment has been conducted for WL3 or can be referred to from previous site investigations.

2. **Groundwater**:
   2.1. The applicants have stated that WL3 has the potential to pollute both superficial and deep groundwater; likely to affect both public and private water supplies (WL3 ES Ch. 9 71.)
   2.2. SPR have stated that mitigation measures, which have not been defined, will reduce this risk to low or negligible.
   2.3. The mitigation measures proposed are those used for preceding Whitelee windfarm and WL WF Extensions 1 and 2. The evidence presented previously by CHG is that these mitigation measures failed to protect water supplies from adverse effects of construction.

3. **Corporate Behaviour:**

   History has demonstrated that SPR has shown disregard to the PWS of

windfarm neighbours who may have been directly impacted by their previous construction activities. CHG have no reason to believe this ethos will be any different for the construction, operation and decommissioning of WL3, or the continued operation and decommissioning of existing Whitelee windfarm or WL WF Extensions 1 and 2.

It appears to be common behaviour for windfarm development companies to regard compliance with planning conditions to be a matterthat is proportionate to the effectiveness of the enforcement by the Local Authority.

4. **Planning Conditions:**
   Previous planning conditions for Whitelee windfarms have not been effectively monitored or enforced and CHG have no reason to believe that any conditions imposed upon the consent of WL3 will be any more effectively enforced than previously.

5. **Visual Impact:** There is already overwhelming visual impact from the existing Whitelee windfarm. The addition of turbines even closer to residential properties, particularly taken in combination with other proposed windfarms will completely blight adjacent properties.

6. **Noise:** The cumulative impact of 215 turbines from the adjacent Whitelee windfarm already produces unacceptable residential noise in some wind conditions. Bringing turbines of WL3 even closer to residential receptors will only increase the cumulative noise. Two of the closest residential neighbours have businesses operating from home which will be impacted by further increase in noise from the additional contribution of WL3.

7. **Legislation**:

7.1. Kingswell water already has a SEPA designated overall status of 'poor'. Under the terms of the Water Framework Directive, adopted by the Scottish Government as a Member State under The Water Environment (Drinking Water Protected Areas)(Scotland) Order 2013, this water body requires to reach a status of 'good' by 22 December 2015.
Given the adverse changes which occurred in surface waters and which were documented to last up to two years after previous impacts on the same body of water as a result of Whitelee windfarm construction, the cumulative construction effects of WL3 are unlikely to allow compliance under the terms of existing legislation.

7.2. Under the terms of the Water Framework Directive, adopted by the Scottish Government as a Member State under The Water Environment (Drinking Water Protected Areas)(Scotland) Order 2013, groundwater must reach a status of 'good' by 22 December 2015. It should be free of listed pollutants and not to have deteriorated.
No groundwater monitoring results are available for WL WF Extensions 1 and 2 and the current status of groundwater is unknown. Without understanding how GW chemistry deteriorated during previous construction ,effective mitigation cannot be devised and there remains a risk that further GW pollution will also fail the terms of the WFD.

7.3. SPR has previously declined to accept any responsibility for PWS under the terms of the Private Water Supplies (Scotland) Regulations 2006.This gives the CHG and residential neighbours no confidence in SPRs willingness to assume its statutory responsibilities towards protecting its neighbours' water supplies.

8. **Community Benefit**:

8.1. The consenting of WL3 will result in the demolition of another traditional stone built farmstead on the Whitelee site – Moor Farm.

8.2. No direct community benefit has been proposed for any residential neighbour or to the nearest communities of Fenwick and Waterside.

For all these reason this application should be recommended to Scottish Ministers for refusal.

RACHEL CONNOR

TIM HARRISON

JOHN CAMPBELL QC

27 JULY 2015