



Phase 1 Contaminated Land Assessment for Transmission Sites

FINAL Report

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1. INTRODUCTION

1.1 Preamble

Environmental Resources Management Limited (hereinafter, referred to as 'ERM') was commissioned by Scottish Hydro Electric Transmission (the 'Client') to undertake a Phase 1 contaminated land assessment review (the 'Assessment') of their 166 operational Transmission sites (electrical substations and sealing end compounds) to improve the understanding of risks associated with potentially contaminated land.

The Assessment was undertaken in accordance with the scope of work set out in the ERM's Proposal 29th November 2018, document reference SF 0455896-03-23.

1.2 Objectives

As part of the implementation of ISO 14001, Scottish Hydro Electric Transmission (SHE Transmission) commissioned ERM to undertake a desk-based assessment of historic contamination risk and site sensitivity across their fleet of substations and sealing end compounds. The purpose of the Assessment was to enhance current knowledge base of these sites and to aid asset management decision making.

The general aim of the Assessment was to enable SHE Transmission to prioritise and fund site improvement works to remediate any identified significant contamination and manage potential pollution risks.

The key objectives in undertaking this Assessment were to provide the following:

- Baseline report for each site;
- risk assessment output and risk rating report for each site;
- recommendations for the requirement of further work; and
- high level summary for comparison / overview of sites.

The deliverables comprised the following:

- Define assessment parameters and process to provide consistent baseline and risk assessment information for each site.
- Report the findings in a summary format which enables a high-level comparison and identification of priority sites to be undertaken.
- Generate a risk rating for each site based on a RAG (Red-Amber-Green) format.
- Provide a high-level recommendation for any further actions required to investigate or mitigate risks.

The Assessment was a desk-based exercise, involving review of readily available information online using a Geographic Information System (GIS) for the 166 sites. Neither site visits nor intrusive investigation works were included in the scope.

1.3 Report Structure

This document (the 'Report') presents the background, the methodology used and the findings generated by the Assessment completed by ERM. The remainder of the Report is set out as follows:

- Section 2 provides an overview and summarises the approach from ERM's Assessment.
- Section 3 summarises the findings of the Assessment.

These sections are supported by the following annexes:

- Annex A – Phase 1 Contaminated Land Desktop Assessment.

1.4 Limitations

This report has been prepared by Environmental Resources Management (ERM) the trading name of Environmental Resources Management Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

This report is based on the application of scientific principles and professional judgment to certain facts with resultant subjective interpretations. Professional judgements expressed herein are based upon the currently available facts within the limits of the existing data, scope of work, budget, and schedule and understanding of the Scottish Environmental Protection Agency's interpretation of the contaminated land provisions of relevant environmental legislation. Results of this assessment are based upon review of information provided by the Client and publicly available and practically reviewable information identifying current and historical uses of the property and surrounding properties. All conclusions and recommendations regarding the sites represent the professional opinions of the ERM personnel involved with the project, and the results of this report should not be considered a legal interpretation of existing environmental regulation. ERM assumes no responsibility or liability for errors in the public data utilized, statements from sources outside of ERM, or developments resulting from situations outside the scope of this project.

2. ERM'S ASSESSMENT

2.1 Overview of Operational Sites

SHE Transmission is the owner of the electricity transmission network for the north of Scotland and forms part of Scottish and Southern Electricity Networks.

The information provided to ERM identified 166 operational Transmission sites (electrical substations and sealing end compounds) in three regions across the north of Scotland as per Table 1.

Table 1: Operational Sites

Region	Number of Operational Sites
Highland	83
North East	35
Tayside	48

The Loch Lundy compound has been decommissioned and was not included within this Assessment.

2.2 Assessment Approach

ERM's approach for the Assessment was based upon an initial high level review of the operational site portfolio to identify the most significant sites in relation to soil and groundwater liabilities. The objective of this desktop assessment was to generate a preliminary assessment of potential sources of impact, and to characterise the overall environmental sensitivity of each site.

To achieve this, ERM utilised a spreadsheet to record details for each site of existing operations, site history and site sensitivity to inform a source – pathway – receptor (SPR) model for each site and then derived a relative (Red, Amber, Green) risk rating. The spreadsheet comprises a row for each site, which includes details of site type, location, area, nature of surrounding area, geology, hydrogeology, surface water, potential receptors and the likelihood of contamination (from current operations and historic land uses) and is provided in Annex A.

Data gathered for each site, using publicly accessible data sets where available, included the following:

- Google Earth Pro was used to identify the extent of infrastructure on-site, the nature of surrounding land-use, and recent site history based on available aerial photography within the GIS (typically dating back approximately 20 years).
- British Geological Survey soil and bedrock data.
- British Geological Survey readily available borehole logs.
- British Geological Survey groundwater data (aquifer permeability description).
- SEPA groundwater classification (from water framework directive).
- Private water supplies.
- SEPA surface water classification (from water framework directive).
- Locations of surrounding ecological sensitivity (SSSI, RAMSAR etc).
- Landfill locations.

Data provided from SHE Transmission included information on each site and the date of installation.

A risk-ranking exercise was then undertaken considering the potential for impacts and site environmental sensitivity. The output of the risk assessment exercise produced a prioritised list of sites requiring further investigation and recommendations for further work.

2.3 Risk Assessment Criteria

The risk assessment completed for each site took into account the likelihood of potential contamination at a site (based primarily on age and size) and the overall environmental sensitivity of the site and surrounding area (including consideration of groundwater, surface water and surrounding land-use) based on the publicly available information. The key criteria for this assessment are presented in Tables 2 and 3 below.

Table 2: Criteria for the assessment of Contamination Risk on Operational Sites

Contamination Risk	Criteria
High	Pre and post 2010 construction and >2 hectares
Moderate	Pre 2010 construction and <2 hectares
Low	Post 2010 construction and <2 hectares

The cut off date of 2010 reflected the use of construction techniques that included environmental precautions following that date, these more recent sites were considered to pose a reduced environmental risk. The use of 2 hectares as the limiting area reflected the greater potential for environmental risks posed by larger sites.

Table 3: Criteria for Overall Environmental Sensitivity

Sensitivity	Groundwater	Surface Water
High	Moderately Permeable Aquifer, Public Water Supply	<100 m
Moderate	Moderately Permeable Aquifer	100-250 m
Low	Low Permeability Aquifer	>250 m

A risk ranking exercise was then undertaken to characterise the sites in order of priority for further assessment, based on the ratings for identified soil and groundwater impact and overall site environmental sensitivity, as per Table 4 below.

Table 4: Criteria for ERM Risk Ranking

Contamination Risk	Groundwater	Surface	Overall Risk
H	H	H	H
H	M	M	H
H	L	M	H
H	L	L	M
H	H	L	H
H	L	H	H
M	H	H	M
M	M	M	M
M	H	L	M
M	M	L	M
M	L	L	L
L	H/M/L	H/M/L	L

3. SUMMARY OF RISK RANKING

ERM undertook an initial desktop assessment to characterise the sites in order of priority for further assessment of soil and groundwater conditions, based on the degree of potential soil and groundwater impact and the overall site environmental sensitivity. Sites assessed with a higher degree of impact and higher environmental sensitivity are considered to be of greater priority for further assessment than those with less impact and/or lower sensitivity.

ERM's risk ranking identified 26 high risk sites, 104 moderate risks sites and 36 low risk sites. A breakdown of the risks per region is provided in Table 5, with ERM's assessment for each site in Annex A.

Table 5: ERM's Risk Ranking per Region

Region	Overall Site Risk	No.
Highland	High	12 (7 post 2010)
	Moderate	47
	Low	24
Northeast	High	10 (7 post 2010)
	Moderate	21
	Low	4
Tayside	High	4 (0 post 2010)
	Moderate	36
	Low	8

The Sites identified as high risk were based on size and the overall site environmental sensitivity. Recently constructed facilities (since 2010) are considered to be of moderate risk due to the use of stricter construction standards and appropriate environmental precautions. However, facilities constructed before 2010 are included for further review of current conditions since the potential for contamination of sub soil and groundwater resulting from historic pre 2010 operations remains. Of the 26 high risk sites, 12 were considered to require further review due to the higher contamination risk.

The list of sites identified as being of highest risk are presented in Table 6 below. They are shown as dark red on the table attached as Appendix A. There was no information (such as known ongoing contamination) made available which indicated any high risks at sites developed after 2010.

Table 6: High Risk Sites – developed pre 2010

Region	Substation Name	Driver
Highland	Beaully Grid	High risk based on size and age
	Beaully Svc	High risk based on size and age
	Fort Augustus Grid	High risk based on size and age
	Knocknagael Grid	High risk based on size and age
	Mybster Grid	High risk based on size and age
Northeast	Blackhillock Grid	High risk based on size and age
	Keith Grid	High risk based on size and age and potential fuel storage contamination risk
	Kintore Grid	High risk based on size, age and site fuel storage since 2008

Tayside	Inverarnan Grid	High risk based on size and age
	Tealing Grid	High risk based on size and age
	Tealing Svc	High risk based on size and age

It should be noted that Sites with moderate and low risk may have a high consequence when located within an environmentally sensitive area, such as adjacent to a surface water course or near an ecological designated site (SSSI, RAMSAR etc). Such Sites are typically associated with hydro-electric power stations or located adjacent to a river.

4. CONCLUSIONS & RECOMMENDATIONS

4.1 Conclusions

The Assessment has been carried out using primarily publicly available data such as satellite imagery and regulatory classifications. Site specific information, such as historic hydrocarbon impact or on-site fuel tanks, has been included where available.

Of the 166 operational Transmission sites, a total of 12 High risk sites have been identified based on a site area of >2 ha and an age of pre 2010. The remainder of the sites with areas greater than 2 ha were downgraded due to more recent post 2010 construction utilising modern construction methods and designed to be protective of the environment. The remainder of the sites were deemed to be of moderate or low risk due to a smaller site area, age of construction or site operations.

It is noted that due to the proximity of some of the sites to surface water (rivers and lochs) the consequence of a spill in some locations could be high despite the risk of contamination being present judged to be moderate or low, for example at hydro-electric power stations. There are over 50 sites with a high consequence identified and these locations have been noted within the table.

Several substation sites are located within larger facilities, for example hydro-electric facilities and power stations. The location and size of the substation in these facilities is not always clear and as such the actual risk posed by the substation itself is not known. In addition, the consequence of contamination resulting from the substation's operation may not be significant when the larger facility is taken into account. In these cases, the risk has been shown based on the substation, but the consequence reduced to reflect the larger surrounding facility if enclosed by the larger facility.

4.2 Recommendations

In order to further define on-site risks, the following actions are recommended:

1. Further review of the 26 High risk sites, to include interview with operations staff and a site visit to review the current conditions of the site and the surrounding area. *The cost per site will vary given the difference in travel time, but is likely to vary between £2,000 and £4,000 per single site visit (not including expenses) depending on distance and logistics.*
2. A general review of the modern (post 2010) construction detail to allow the contamination mitigation measures (tank bunding, drainage & interceptors, membranes etc) to be determined. Reference would be made to material storage and volumes on a site by site basis. Specific focus on the presence of bunding within smaller sites as it may not be present within each building, this would be carried out through the use of a questionnaire and discussion with regional managers for efficiency.

It is likely that the cost for this review would be in the region of £7,500 to £10,000 depending on the volume of data available for review.

3. Further assessment of the sites located within larger facilities to determine the actual size of the substation to allow the risk rating to be refined. *It is likely that the cost for this review would be in the region of £5,000.*
4. Review of Source Pathway Target at sites to facilitate production / updating of emergency response plans. *The cost of this per site would be in the region of £750 to £1,500 depending on the size and complexity of the installation and the surrounding environmental receptors.*
5. Production of design guidance for new sites to reduce source-pathway risk and aid emergency response. Identification of current control systems to aid remote / fast response. *Estimated cost of generating guidance per site would be in the region of £1,500 to £2,500 depending on the size of site and the level of detail required.*

6. Given that there is no soil and groundwater data currently available for the portfolio, it is recommended that site investigations are carried out at sites across the portfolio to determine the current level of soil and groundwater contamination. The suggested sites are listed below and are selected to focus on High risk sites but also include sites within the Moderate and Low bands. The Moderate and Low risk sites were included in order to calibrate the risk process and determine the actual conditions at such sites.

Table 7: Proposed Site Investigation Sites

Region	Substation Name	Driver
Highland	St Fergus Gas Terminal Grid	High risk, although mitigated due to the size of the adjacent terminal
	Beaully Grid	Large 4 ha site, part constructed on backfill material within quarry
	Dunbeath Grid	Moderate risk small <2 ha site, operational since 1986
Northeast	Kintore Grid	High risk and potential contamination due to pre 2010 fuel storage
Tayside	Ardkinglas Grid	High risk and potential contamination due to pre 2010 fuel storage
	Tummel 275 / 132 kV	Post 2010 site rated Low Risk. Identified due to fuel storage on site since 2013
	Tealing Grid	High risk due to size and age, also potential off-site hydrocarbon impact from adjacent airfield

The scope of the investigations would vary depending on the size and age of the site together with the extent of the infrastructure. As a minimum, three boreholes drilled to approximately 6 metres depth including water sampling installations would be required to allow groundwater flow to be triangulated.

On the assumption that the site investigation would be carried in a single sequence, a conservative estimate for the cost of advancing three boreholes at a site would be in the region of £20,000 to £25,000. Given the current uncertainty around the logistics surrounding the current COVID-19 stand down, it is recommended that this should be reviewed again once the travel restrictions are relaxed, or the practicalities better understood.

APPENDIX A PHASE 1 CONTAMINATED LAND DESKTOP ASSESSMENT

See attached spreadsheet.

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