Torlundy Village Expansion – North Area

Phase 1 Geo Environmental and Flood Risk Study

October 2009
Final

Issue No 1
44763058 /

COPYRIGHT

LIMITATION

URS has prepared this Report for the sole use of Dr D F Berardelli c/o DSM Management in accordance with the Agreement under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and expressed written agreement of URS. Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant change.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by URS, unless otherwise stated in the Report.

Where assessments of works or costs required to reduce or mitigate any environmental liability identified in this report are made, such assessments are based upon the information available at the time and are subject to further investigations or information that may become available. Where assessments of works or costs necessary to achieve compliance have been made these are based upon measures which, in URS's experience, could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

CONTENTS

1. INTRODUCTION

1.1. Purpose of Report

URS Corporation Ltd. (URS) was appointed by DSM Manage met on behalf of Dr D F Berardelli in September 2009 to undertake a Flood Risk and Phase 1 Geo Environmental Assessment of a site on the outskirts of Torlundy Village.

This report has been written to support the allocation of the area for a new community settlement as identified in the West Highland and Islands Local Plan, which at the time of reporting is at "Deposit Draft" stage.

1.2. Structure of the report

The report is in two parts, each with specific aims and objectives.

Part A of the report considers the Geo-Environmental conditions which are expected to be encountered on the site.

The main objectives of the Phase 1 Assessment are as follows:

- To assess the historical use of the site;
- To assess the general geology, hydrology and hydrogeology of the site;
- To describe existing site surface conditions;
- To assess the mineral stability of the site;
- To assess the potential risk of contamination at the site; and
- To draw conclusions and provide comment on the extent of intrusive investigations required.

Part B of the report considers the risk of flooding within the allocated area.

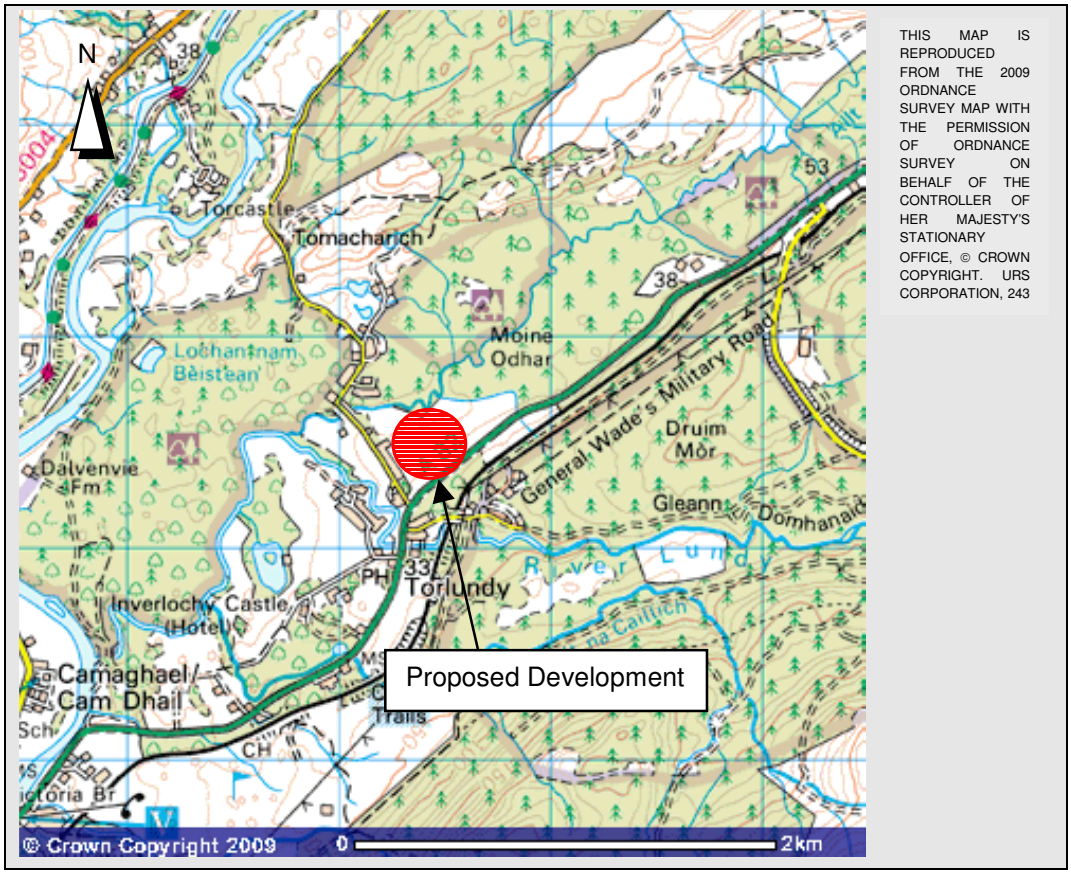
The flood risk assessment has been prepared to address matters with regard to flood risk in accordance with the guidance contained in Scottish Planning Policy SPP7 "Planning and Flooding".

Other guidance considered in the flood risk study are listed in Section 3.3.

1.3. Site Setting and Background

The site is located on the north eastern outskirts of Torlundy Village, approximately 6km north east of Fort William, in the Highlands of Scotland. The grid reference of the approximate centre of the site is 214430, 777490. A site location plan is shown in Figure 1.1 and a larger scale map is attached in Appendix A.

Figure 1.1 - Site Location



1.4. Site Description

The following site description was compiled from an examination of topographical maps and aerial photographs.

The site, which is approximately 12.3ha in area, comprises a roughly rectangular shaped parcel of land currently occupied by rough pasture. The site is bound by land adjacent to the surface water feature denoted as Allt Achadh na Dalach to the north, by open land to the east, by the A82 Road to the south, and by residential housing and an unspecified road to the west. Topographically, the site is generally flat although towards it northern boundary the ground begins to slope away towards Allt Achadh na Dalach.

PART A

2. PHASE 1 GEO-ENVIRONMENTAL RISK ASSESSMENT

2.1. Scope of Work

The following provides a summary of the Phase 1 Geo-environmental Assessment undertaken for the preparation of this report:

- A review of historical Ordnance Survey maps to determine the historical development of the site;
- A review of published geological and hydrogeological maps in order to understand the geological setting of the site;
- A qualitative assessment of the potential for soil and groundwater contamination; and
- The identification and interpretation of geotechnical and environmental constraints and provision of recommendations for further exploratory works.

2.2. Methodology

2.2.1. Documentary Research

The history of the site and accounts of the environmental setting were compiled from an examination of historical and current Ordnance Survey sheets and published geological information.

2.2.2. Consultations

The following bodies were consulted during the course of the investigation:

- Landmark Information Group (Envirocheck);
- The British Geological Survey (BGS);
- Scottish Environment Protection Agency (SEPA);
- Scottish National Heritage (SNH);
- The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS).

2.3. Site History

The following accounts of the historical development of the site are based upon an examination of available Ordnance Survey maps and aerial photographs. Copies of relevant historical maps and aerial photographs are included in Appendix B. The full set of historical plans received and reviewed are included in the Envirocheck Report available on CD in Appendix C.

Date	Site Conditions	Surrounding Area
1874	Site comprised of 'rough pasture'; North-south trending water feature bisects the site.	Unspecified road located on the southern site boundary; Wooded area located on the western site boundary; East-west trending water course located approximately 50m to the north of the site, confluencing with north-south trending water course located approximately 100m west of the site; Building denoted 'Torlundy' located approximately 150m south of the site.
1902/1904	Further two north-south trending watercourses noted on site. Western portion of site not shown as rough pasture.	Wooded area noted directly north of the northern water course; Southwest-northeast orientated railway line noted 100m to the south of the site; Two further buildings noted adjacent to 'Torlundy'.
1945	Tree belt approximately 50m wide bisects the site.	No significant changes noted in the area surrounding the site.
1975	Two water features no longer denoted. New water course along former field boundary in the west of the site. 'Central' water course no longer shown, possibly diverted into 'new' western water course.	Unspecified water feature located on the eastern site boundary; Three buildings denoted 'Brick Works' located approximately 40m south west; Wooded area to the north expands eastwards; 'Depot' located approximately 100m to the south; General residential development to the south and west as part of the expansion of the settlement of Torlundy; Water course to the north denoted 'Allt Achadh na Dalach' and water feature to the west denoted 'River Lundy'. Road to the south denoted 'A82'; ***Contd /***

Date	Site Conditions	Surrounding Area
2001	Track noted in north western site corner.	Residential housing noted directly west of the site boundary, with further residential development noted to the west of the site; 'Riding and Trekking Centre' located approximately 150m northwest of the site; 'Brick Works' denoted as 'Coal Yard'.
2006/2009	No significant changes.	No significant changes noted in the area surrounding the site.

2.4. Geology

Information regarding the geological conditions at the site was obtained from the BGS 1:50000 scale Geological Sheet of Scotland 62(E) and is summarised as follows:

The natural superficial deposits beneath the site are recorded to comprise granular glacial deposits, with a chance of encountering alluvial deposits to the north of the site due to the proximity to Allt Achadh na Dalach. Additionally, localised deposits of peat are recorded within the vicinity of the site, the closest occurrence being 100m to the south east. Although none is recorded within the site boundary, the possibility of encountering peat deposits beneath the site cannot be ruled out.

The solid strata beneath the site are expected to comprise Monian deposits comprising psammite with subordinate bands of semi-pelite and/or pelite. The depth to bedrock is unknown.

2.5. Hydrology

The nearest recorded water feature is located on site, flowing from south to north. Outwith this, an unspecified water course is recorded directly east of the site, with the Allt Achadh na Dalach river located approximately 50m north of the site, and the River Lundy located approximately 100m west of the site.

Additionally, in 1904, an unspecified water course is recorded to cut across the centre of the site, trending south east to north west. By 1973 this water course was no longer recorded.

2.6. Hydrogeology

The Groundwater Vulnerability Map of Scotland published by the BGS, indicates the majority of the site is underlain by bedrock generally comprising rocks of moderate permeability. These are fractured or potentially fractured rock, which do not have a high permeability, or other forms of variable permeability. The far north of the site is recorded to be underlain by weakly permeable rocks. These are formations of generally low permeability that do not widely contain groundwater in exploitable quantities.

The BGS Hydrogeological Map of Scotland (1988) indicates that the underlying bedrock strata are classed as concealed aquifers of limited or local potential.

2.7. Environmental Issues

The Landmark Information Group was contacted and an Envirocheck Report was obtained for the site and surrounding area. The report contains information that is provided by a number of bodies including SEPA, the BGS and the Ordnance Survey. Relevant Information (within 250m of the site boundary) ascertained from the report is discussed below.

Environmental Issue	Distance (m) and direction from site within 250m	Details
Discharge Consent	36(NW)	Registered to an unknown operator by SEPA on 1 September 1988 to allow sewage – septic tank soakaway. The receiving water is specified as land. The status is not supplied.
Contemporary Trade Directory	47(SW)	Licensed to Caledonian Coal Distributors Ltd and classed as coal and smokeless fuel merchants and distributors. Its status is currently inactive.
Registered Waste Transfer Site	67(S)	Licensed to Lochaber Environment Group by SEPA on 15 September 2005 to transfer with treatment the following types of waste: • Degradable commercial waste; • Degradable household waste; • Degradable industrial waste; • Edible oil and food; • EWC 16.02.22 (HAZ) waste electrical equipment containing cfc, hcfc, hfc; • EWC 16.02.13 (HAZ) waste electrical equipment containing dangerous components; • Waste furnitures; • Waste electrical goods. The status is operational. **Contd** /

Environmental Issue	Distance (m) and direction from site within 250m	Details
Discharge Consent	128(SW)	Registered to an unknown operator by SEPA on 1 April 1987, the discharge type is not specified. The receiving water is the River Lundy. The status is not supplied.
Discharge Consent	143(NW)	Registered to an unknown operator by SEPA on 1 February 1994 to allow other matter effluent discharge. The receiving water is Allt Achadh na Dalach. The status is not supplied.
Registered Landfill Site	206(S)	Licensed to Highland Regional Council by SEPA on 1 January 1991 to allow sewage sludge cake. The status is listed as licence lapsed/cancelled/defunct/not applicable/surrendered/cancelled.
Contemporary Trade Directory	208(W)	Licensed to Torlundy Plant Maintenance and classed as plant and machinery repairs. Its status is currently active.
Discharge Consent	226(NW)	Registered to an unknown operator by SEPA on 1 May 1990 to allow sewage – septic tank soakaway. The receiving water is specified as land. The status is not supplied.
Discharge Consent	235(S)	Registered to an unknown operator by SEPA on 1 August 1988 to allow public sewage: secondary (biological filters). The receiving water is the River Lundy. The status is not supplied.

2.8. Ground Stability

A Ground Stability Report for the site and surrounding area was obtained as part of the Envirocheck Report. The report is compiled of information provided by a number of bodies including SEPA, the BGS, The Coal Authority and Ordnance Survey. Relevant Information (within 250m of the site boundary) ascertained from the report is summarised below. The full report is included in the Envirocheck Report available on CD in Appendix C.

Mining and Natural Cavities Data

No records of shallow mining exist for the site.

Historical Land Use Information

A brickworks, considered to be a extractive industry, was recorded 11m south west of the site in 1972 but was no longer present by 2001. There is no evidence to suggest mineral extraction took place on site.

One area of potentially infilled land has been identified on site. This relates to a water course, recorded on site in 1904. The feature cuts across the centre of the site, trending south east to north west.

Ground Stability Data

The site is located within an area where:

- The potential for compressible ground hazards is low to moderate;
- The potential for landslide hazards is very low to low;
- The potential for running sand hazards is very to low; and
- The potential for shrinking or swelling clay hazards is very low.

2.9. Other Sources of Information

2.9.1. Scottish Environment Protection Agency

Rivers are classified by SEPA from which the quality ratings range from Class A1 (excellent) to Class D (seriously Polluted).

A search of SEPA's online database was conducted regarding the water quality within the vicinity of the site and reported that Allt Achadh na Dalach is Class B (good) in 2007 and the River Lundy is Class C (moderate) in 2007. The other surface water features identified in the vicinity of the site were not covered by SEPA's River Quality Classification Scheme.

2.9.2. Scottish Natural Heritage (SNH)

A search on the SNH database confirmed that there are no statutory designations within or adjacent to the site.

2.9.3. The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS)

The RCAHMS database, PASTMAP, was consulted regarding the presence of protected buildings or archaeological monuments within the site boundary or the surrounding area.

Three records were found within 500m of the site in the Scottish Sites and Monuments Records. These were located at approximately 320m southeast of the site in relation to

the Fort William/Fort Augustus/Inverness Military Road and the Tom a Cloich Ford. A further record was located 380m southeast of the site in relation to Torlundy.

One record was found within 500m of the site in the National Monuments Record of Scotland. This was located approximately 320m to the southeast of the site and was recorded in relation to the Tom a Cloich Ford.

One record was found within 500m of the site in Scheduled Ancient Monuments. This was located approximately 320m to the southeast of the site and was recorded in relation to the Caledonian Canal.

It is not envisaged that this will affect the proposed development at the site. Further advice on features appearing on the National Monuments Record of Scotland should be directed to RCAHMS.

2.10. Preliminary Conceptual Site Model and Qualitative Assessment

2.10.1. General

The approach adopted by URS to assessing risk associated with land contamination is in line with the Scottish Government's approach outlined in Planning Advice Note (PAN) 33 *Development of Contaminated Land.* The Government considers that the most appropriate approach is a 'suitable for use' one in which risks to human health and the wider environment are assessed within the context of the current or proposed use of the land in question thereby limiting any requirements for remediation to the work necessary only to mitigate unacceptable risks arising within the context of the current or proposed use. The methodology adopted is described in detail in Environment Agency Report CLR11: Model Procedures for the Management of Land Contamination and relies on the development of a site specific conceptual site model (CSM) consisting of three components:

- A **source** of contamination, for example due to historical site operations;
- A **pathway**, a route by which receptors can become exposed to contaminants. Examples include vapour inhalation, soil ingestion and groundwater migration;
- A **receptor**, a target that may be exposed to contaminants via the identified pathways. Examples include human occupiers/users of the site, the Water Environment, property or ecosystems.

For a potential risk to either environmental and/or human receptors to exist, a plausible pollutant linkage involving each of these three components must exist. If one of the components is absent then a pollutant linkage, and thereby potentially unacceptable risk, is also unlikely to exist. Where all three components are or may be present, a potentially complete pollutant linkage can be considered to exist. This does not automatically imply the presence of unacceptable risk but further investigation of the potential pollutant linkages is required.

2.10.2. Preliminary Conceptual Site Model

At this stage the preliminary CSM has been developed to identify potentially complete pollutant linkages and to identify potential linkages that require further investigation to assess their existence and/or potential significance.

The potential source of contamination on or in the vicinity of the site, receptors on or near the site, and pathways on or near the site are discussed within this section.

2.10.2.1. Potential Sources of Contamination

The historical and current information on the site suggest that the site has always been 'greenfield' and as such it is likely that ground contamination from on site sources is not a significant issue at the proposed development site. However, two potential sources have been identified in relation to previous watercourses on site and to the use of the land for agricultural purposes:

Potential On Site Contaminant Sources	Potential Contaminants Associated with Source
Potentially infilled ground, relating to a watercourse recorded on site in 1904.	Made ground of unknown origin may contain a number of contaminants including heavy metals, inorganic compounds and hydrocarbons.
Potential for fertiliser/pesticide application during agricultural activity on site.	Elevated levels of nitrates, potassium and phosphates and pesticides may be present.

The following potential off site sources of contamination and potential contaminants derived from the historical and current use of the surrounding area have been identified up to 250m and anything significant up to 500m:

Potential Off-Site Sources of Contamination	Potential Contaminants Associated with Source
Railway line approximately 100m south of the site.	Contaminants associated with railways may include heavy metals, phenols, sulphates, TPHs and PAHs.
Brick works / coal yard located 40m south west of the site.	Contaminants associated with operations at this site may include heavy metals, TPHs and PAHs.
Waste transfer site 70m south of the site.	This facility is licensed to transfer (with treatment) degradable commercial, industrial and household waste, waste electrical equipment and waste furniture. Contaminants associated with such operations may include nitrates, ammonia, sulphates, chloride, TPHs, fatty acids and leachates.
Registered landfill site 200m south of the site.	This facility, which is no longer operational, is recorded to have been associated with the production of sewage sludge cake. Contaminants associated with such an operation may include landfill gases, nitrates, ammonia, sulphates, chloride, TPHs, fatty acids and leachates.

2.10.3. Potential Receptors

The following potential receptors have been identified which could be adversely affected by any contamination at the site:

Potential Receptors	
Human Health	- Future users of the site; - Future on site workers, residents and visitors; - Off site workers, residents and visitors including potential groundwater users.
The Water Environment	- Groundwater within the underlying superficial deposits; - Groundwater within the underlying bedrock; - Surface watercourses (unnamed water feature on site, Allt Achadh na Dalach to the north of the site and the River Lundy to the west of the site).
Construction Materials	- In future developments including concrete foundations and water mains.
Vegetation	- In gardens or landscaped areas.

2.10.4. Potential Pathways

Potential pathways have been identified that could link the potential sources with the potential receptors. These are discussed by receptor type overleaf in consideration of the developed of the site.

Potential Pathways	
Human Health	- Future users of the site by direct contact, inhalation and ingestion; - Future on site workers, residents and visitors by direct contact, inhalation and ingestion; - Off site workers, visitors and resident by direct contact, inhalation and ingestion of windblown dust, contaminated groundwater migrating off site and contaminated water migrating off site via underground utility services.
The Water Environment	- Groundwater within the underlying superficial deposits by migration of contaminants via shallow groundwater potentially contaminated off site; - Groundwater within the underlying bedrock by leaching and migration through the natural superficial deposits; - Surface water by leaching and lateral migration of contaminants via shallow deposits and service runs; - Surface water by migration of contaminants via groundwater.
Construction Materials	- Plastics and sealants by direct contact with contaminants that may degrade materials; - Building materials by direct contact with contaminative materials; - Migration of flammable/asphyxiant gases.
Vegetation	- Uptake via root.

2.10.5. Qualitative Assessment of Source-Pathway-Receptor Linkages

A preliminary qualitative assessment of the potential risk to receptors has been made based on the source, receptors and pathways identified within the Phase 1 Assessment.

A pollutant linkage is the relationship between a source, pathway and receptor. If all three of these factors have been recognised and are 'linked' a possible pollutant linkage can be identified. If one or more of the three factors are not present then no pollutant linkage can be established.

Due to the "greenfield" character at the site the only possible sources of contamination are the potential for pesticide/fertilisers having been applied to the land during agricultural use and the possible presence of localised made ground deposits associated with the infilled watercourses located on site.

It should be noted that contamination is not just restricted to land with previous industrial use; it can occur on greenfield sites as well, due to naturally elevated concentrations of certain determinants. Contaminants originating from off-site sources (such as the brick works/coal yard, railway and waste transfer station/landfill site to the south of the site) can also migrate onto the site within groundwater.

The risk to site operatives involved in the construction of the proposed residential development due to contamination that may be present in soil or groundwater underneath the site is considered to be low. However if site operatives come into contact with contaminated soil and/or groundwater a complete pollutant linkage is possible.

The risk to future site users and/or the water environment at the proposed site is assessed to be low.

As no contamination source is likely to be present underneath the site the risk to site flora and construction materials is considered to be very low.

The overall risk to identified receptors is assessed to be **VERY LOW** to **LOW** based on the potential for contamination being present on site and the proposed end use of the site as a residential development.

2.11. Part A - Conclusions and Recommendations

2.11.1. Summary of Ground Conditions

The general nature of the natural superficial deposits beneath the site are recorded to comprise granular glacial deposits.

The desk assessment has also identified that the site is located within an area where:

- The potential for compressible ground hazards is low to moderate;
- The potential for landslide hazards is very low to low;
- The potential for running sand hazards is very to low; and
- The potential for shrinking or swelling clay hazards is very low.

The Preliminary Conceptual Site Model and Qualitative Assessment has assessed the overall risk to identified receptors is assessed to be **very low** to **low** based on the potential for contamination being present on site and the proposed end use of the site as a residential development

2.11.2. Possible Constraints due to Ground Conditions

Notwithstanding the above, based on the information reviewed during the Desk Study Report it is considered that the following points may pose a potential constraint and therefore require further investigation.

Site Condition	Potential Constraint to Development	Proposed Action
Natural Superficial Deposits	Compressible ground hazard, abnormal foundations.	Assess thickness and engineering properties through intrusive investigation techniques.
Made Ground (associated with infilled watercourses)	Poor founding strata; unknown thicknesses; contamination.	Assess extent, thickness and engineering properties through intrusive investigation techniques. If encountered carry out laboratory analysis on representative samples to assess engineering properties and the presence of contaminants.
Underlying Bedrock	Unknown depth and condition – may require abnormal foundations.	Investigate nature and strength of bedrock using intrusive investigation techniques.
Underground Services	Unknown extent and condition.	Undertake a complete services search prior to the intrusive investigation.

Soil Gases	Gas protection measures.	Install gas installations during intrusive investigation and monitor soil gas upon completion of site works.
Groundwater Contamination	Unknown extent of contamination	Recovery of water samples from monitoring wells installed on site.

2.11.3. Future Works

Ground investigation works are considered necessary to obtain additional information by which to assess the potential constraints identified above. Such investigation work would typically be expected to include:

- Machine excavated trial pits, excavated across the site at a nominal 50m grid, to obtain geotechnical and environmental information relating to the superficial deposits;
- Light percussion boreholes, sunk to approximately 10mbgl to provide geotechnical information on the deeper superficial deposits as well as to provide information relating to the depth to groundwater and bedrock strata (if encountered);
- Installation of gas and groundwater monitoring wells within boreholes to allow the monitoring of methane, carbon dioxide, oxygen, hydrogen sulphide and carbon monoxide levels and groundwater levels as well as allowing groundwater samples to be recovered for laboratory analysis;
- Laboratory analysis of soil samples for geotechnical and chemical parameters;
- Where it is possible to recover groundwater samples, groundwater analysis will be undertaken.

The ground investigation should be carried out in general accordance with BS 5930:1999 'Code of Practice for Site Investigation' and BS 10175:2001 'Investigation of Potentially Contaminated Sites – Code of Practice'.

PART B

3. ASSESSMENT OF FLOOD RISK

3.1. Methodology

The flood study has investigated the following aspects:

- Existing Site Drainage Characteristics
- Assessment of Flood Risk

The methodology in assessing each of these aspects is discussed in turn below.

3.2. Existing Site Drainage Characteristics

The pre development drainage characteristics of the site have been determined by assessing both the topographical and hydrological aspects of the proposed development along with drainage infrastructure serving the existing site, if any.

This section will highlight information that is to be considered during the detailed design stage.

3.3. Flood Risk Requirements

In undertaking this study, the flood risk assessment has been carried out with reference to the following guidance and documentation:

- **Scottish Planning Policy (SPP) 7 "Planning and Flooding"**. SPP7 is the primary guidance document for those undertaking developments that may be at risk from flooding from any source. SPP7 sets out requirements and criteria for consideration by developers and planners when taking flood risk and drainage into account.
- **Planning Advice Note (PAN) 69 "Planning and Building Standards Advice on Flooding"**, provides background information and best practice advice in support of both the SPP7, and the technical handbooks which provide improved guidance on building in areas where there is a risk of flooding.
- **CIRIA C624 "Development and Flood Risk"**, provides practical guidance to developers and construction industry on the implementation of planning guidance in the assessment and management of flood risk as part of the development process.
- **SEPA's Guidance "Technical Flood Risk Guidance for Stakeholders"**, in conjunction with Annex B of SEPA Policy 41 provides guidance in undergoing the flood risk assessment process regarding methodologies and reporting requirements.

3.4. Data Collection

Table 3.1 provides an overview of the data that has been collected and used within this assessment.

Table 3.1 – Data Collection

Purpose	Data and Source	Comments
Identification of site features	Ordnance Survey Maps	Identifies the position of the site and local hydrological features
	SEPA Guidance Document *'Technical Flood Risk Guidance for Stakeholders'*	Provides guidance in undergoing the FRA process
Topographic data of the site	Ordnance Survey 1:25,000 scale map	Provides and informs general topography
Hydrological Data	Flood Estimation Handbook (FEH)	Defines catchment characteristics of the site
	WRAP Map of UK	Defines soil runoff characteristics

3.5. Existing Drainage Characteristics

3.5.1. Site Topography

Review of the OS Maps indicates that the development site predominantly drains in a northwest direction. Ground levels range from approximately 39m AOD (taken on the A82 Road to the south east of the site) to some 20m AOD to the northwest.

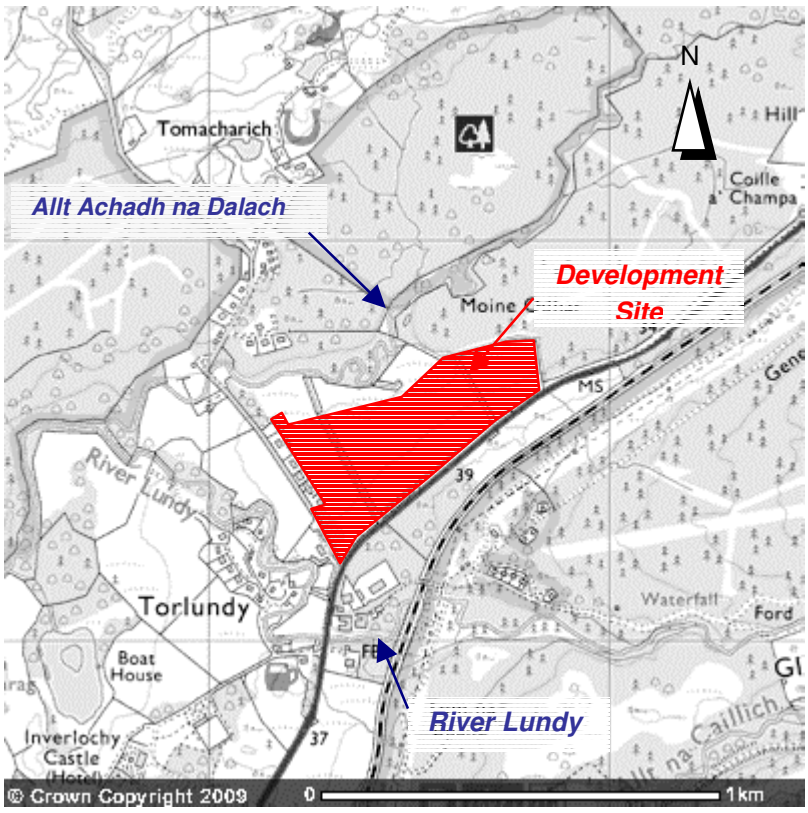
3.5.2. Site Hydrology and Drainage Catchment

Two main watercourses were identified in the proximity of the sitet. These watercourses are known to be the River Lundy, flowing the south and southwest of the site and its tributary, the Allt Achadh na Dalach, flowing to the north of the proposed development as shown in Figure 3.1.

A review was undertaken using both the FEH CD-ROM Version 2.0 and the 1:25k OS Map in order to identify the topographical catchment associated with the development site.

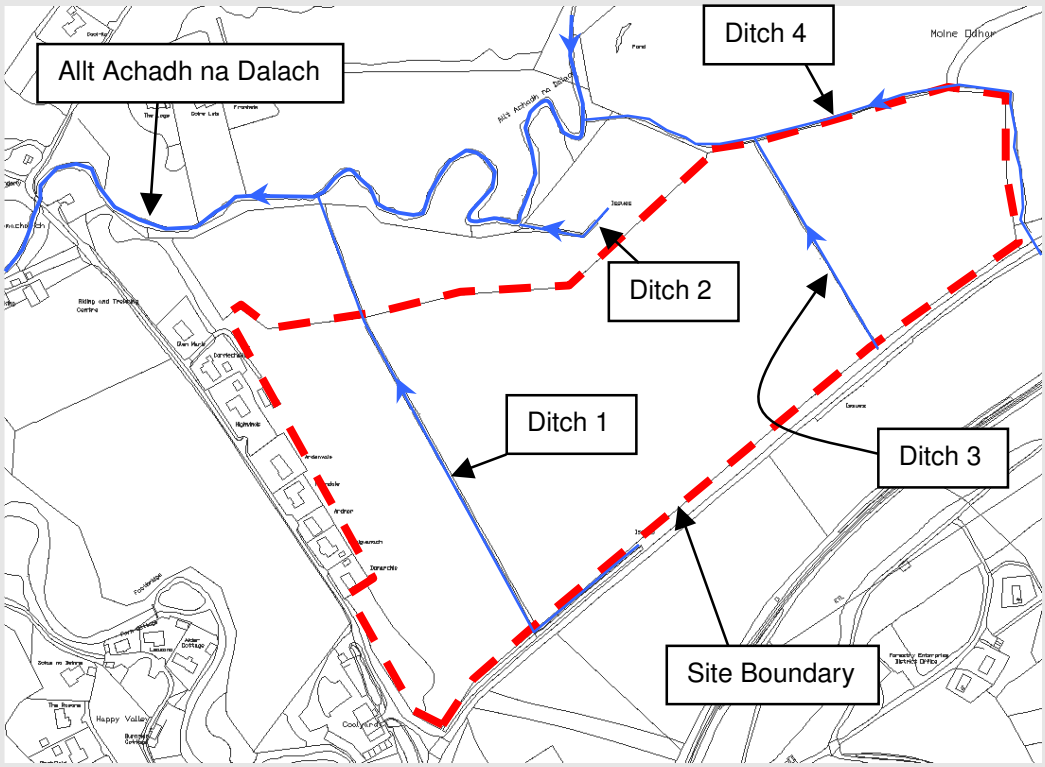
This identified that the proposed development is located within the catchment of the Allt Achadh na Dalach that flows with a predominantly northeast to southwest direction before joining the River Lundy some 400m to the west of the site.

Figure 3.1 –
Plan showing location of the River Lundy and Allt Achadh na Dalach.



The OS Map also indicates that a number of unnamed ditches locally feed into the southern side of the Allt Achadh na Dalach. Figure 3.2 below indicates that ditch 1 crosses the proposed development while ditch 3 and 4 border the western and northern (for a small section) site boundary. The OS Map does not clarify the nature of these water features. However due to the close proximity of the A82 road, it is likely that ditch 1 and 3 are used to convey surface water from the road towards the Allt Achadh na Dalach.

Figure 3.2 –
Allt Achadh na Dalach and its southern tributary.



3.6. Existing Drainage Infrastructures

Following review of Scottish Water Asset drawings, there are no public sewers within the boundary of the study area.

The general area is served by a waste water treatment works at Happy Valley, some 0.5km west of the site. The existing row of dwellings along the south west boundary of the study area are drained to the north to a pumping station near the bridge across Allt Achadh na Dalach, which in turn transfer waste water to the treatment works via rising main.

3.7. Flood Risk Assessment

3.7.1. Assessment Criteria

The strategy to mitigate flood risk has been undertaken with reference to Scottish Planning Policy 7 – *Planning and Flooding.* This notes the following key points for assessment.

> *'Developers and planning authorities must give consideration to the possibility of flooding from all sources.'*
>
> *Paragraph 15 – SPP7*
>
> *'Any drainage measures proposed should have a neutral or better effect on the risk of flooding both on and off the site.'*
>
> *Paragraph 15 – SPP7*
>
> *'For planning purposes the functional flood plain will generally have a greater than 0.5% (1:200) probability of flooding in any year.'*
>
> *Paragraph 16 – SPP7*
>
> *'For coastal and watercourse flooding a Risk Framework characterises areas for planning purposes by their annual probability of flooding and gives the planning response:*
>
> - *Little or no risk area (less than 0.1%* (1:1000)*) – no general constraints*
> - *Low to medium risk area (0.1% to 0.5% (1:1000 – 1:200)) – suitable for most development but not essential civil infrastructure.*
> - *Medium to high risk area (0.5% (1:200)) or greater – in built up areas with flood prevention measures most brownfield development should be acceptable except for essential civil infrastructure; undeveloped and sparsely developed areas are generally not suited for most development. (These probabilities include an allowance for climate change. An allowance for 'freeboard' will be additional).'*
>
> *Summary – SPP7*
>
> *'it is not national policy to add an additional allowance for climate change above the 0.5% probability but planning authorities may do so if can be justified'*
>
> *'A freeboard allowance may be required as a response to local circumstances.'*

Paragraph 36 – SPP7

'Any allowance for climate change should be independent of the freeboard allowance'

Technical Flood Risk Guidance for Stakeholders - SEPA

'developers and planning authorities should also take into account as appropriate:'

'Effects of a flood on access, including by emergency services'

Adapted from Paragraph 37 – SPP7

In summary, SPP7 notes that the residential nature of the development should be protected against the 1 in 200 year return period. This probability already includes an allowance for climate change, though it is not a national policy to add it on. However, with reference to SEPA document "Reporting Requirements for Flood Risk Assessments", it is considered appropriate that the development should be adequately protected against the 1 in 200 year plus climate change scenario. This should be taken as the design requirement for the proposed development. It is further considered that an additional Freeboard allowance is incorporated.

The assessment of flood risk should be carried out with regards to flooding from all sources. This includes fluvial flooding, pluvial flooding and overland flow flood risk. Furthermore no additional flood risk should be passed onto either upstream or downstream property.

In undertaking the Flood Study, URS have considered the relevant and available information relating to flood risk associated with the proposed development and the immediate surrounding area, identified below as:

- 1:25,000 Ordnance Survey (OS) Map
- Drainage characteristics of the proposed site,
- Indicative SEPA 2nd Generation Flood Map.

3.7.2. Fluvial Flood Risk

3.7.2.1. SEPA Flood Map

The 2nd Generation Flood Map (Indicative River & Coastal Flood Map) published by SEPA shows areas of land in Scotland that have been assessed to be at risk of flooding from either rivers or the sea (or both) for a range of storm events as required by SPP7.

The flood map is based on the most up to date flooding information available and provides a high quality and scientifically robust indication, at a scale of 1:50,000, of areas which may flood. However, according to SEPA 's website, the following should be noted with regard to using the flood map:

> *"It does not provide enough detail to accurately estimate the flood risk associated with individual properties or specific point locations.* ***Local factors such as flood defence schemes, structures in or around river channels such as bridges, buildings and other local influences, which might affect a flood, have not been included****. Furthermore, the flood map only shows flooding from rivers or the sea and does not account for flooding from other sources such as surface water runoff, surcharged culverts (where rivers which have been channelled underground flood) or drainage systems. Use of the flood map is at the user's own risk, so users must ensure that the map is suitable for the intended purpose."*
> *Source: SEPA website*

Review of the 2nd Generation Flood Map (Indicative River & Coastal Flood Map) suggests that an area to the south of the Allt Achadh na Dalach is at risk of fluvial flooding for the 1 in 200 year flood event.

As a general guide, the corresponding level of the extent of the area at flood risk does not go beyond the 20m OD contour. It is recommended that at this stage, the development footprint recognises this contour as the limit for development, including SUDS provision which should be outwith the 1 in 200 year risk area.

As the site boundary as indicated in Figure 3.2 is generally outwith the area identified at risk of flooding, the proposed development is not within an area at risk of flooding. A localised area at the north on the site is within or immediately adjacent to the flood risk envelope, and it is recommended that development does not encroach on this area.

3.7.3. Pluvial Flood Risk

The assessment has been carried out with reference to the flood risk probability associated with overland flow paths, their related relief levels and the potential to impact the proposed site or existing buildings and/or safe access and egress locations through pluvial flooding.

Through review of the available information, the site falls gradually and evenly south-east to north-west from the A82 to the north west boundary of they site and Allt Achadh na Dalach beyond.

No topographical depressions within the site boundary were identified that may pose a risk of pluvial flooding. Ditches 1 and 3 from Figure 3.2 represent localised, linear low areas but with the specific purpose to convey water to Allt Achadh na Dalach.

The site is not considered to be at risk of flooding from pluvial flooding.

3.7.4. Overland Flows

This assessment has examined potential flow paths arising from the topographical channelling of overland flows resulting from high intensity storm events, which have the ability to bypass the normal drainage networks.

The A82 along the south eastern boundary of the study area generally sits above the levels on the site, and surface water from this corridor can reasonable be expected to drain across the study area.

Ditches 1 and 3 which traverse the site would appear to form part of a formal system for the conveyance of these flows, and this can be expected to remain the case during high intensity storm events.

While a detailed assessment of the extent to which hydraulic capacity of these ditches would be able to continue to convey high intensity run-off, the impact on the site is considered nominal. Surface water flows outwith the channel would continue to in a north-west direction approximately parallel with the lines of the ditches.

On the basis of the above, overland flow flooding from existing sources is not considered an issue for the development area, although mitigation should be included within the developed proposals as discussed below.

3.8. Mitigation of Flood Risk and Drainage Management

It is proposed that the development will manage and control surface water run off in order to mitigate any impact associated with flood risk to the proposed development. This is to be achieved by:

- Restricting the post development surface water discharge to an appropriate pre-development or Greenfield run off rate, to be agreed with the local authority.
- Again subject to agreement witth the Local Authority, provide on site attenuation for storm event up to 1 in 200 year return period excluding climate change.
- Manage post development overland flow paths associated with high intensity storm events (such as those identified from the A82 above) to limit any adverse impact to the adjacent properties and the development site itself.
- Maintain the current drainage pattern, related to runoff from external sources, through the site without ponding or otherwise posing an unacceptable flood risk.

Acceptance to these proposals will be clarified during the detailed design and approval stage through consultation with Scottish Water, SEPA and Highland Council's Flood Prevention Officer respectively.

3.9. Part B - Conclusions and recommendations

This assessment has considered the potential risk of flooding associated with watercourses, topography of the site, overland flow and measures that will be taken to manage these risks.

- Review of the 2nd generation Flood Maps as published by SEPA suggests that an area to the south of Allt Achadh na Dalach is at risk from fluvial flooding for the 1 in 200 year return event
- As the study area boundary is generally outwith this area, and as such outwith an area which could be deemed as having a medium to high flood risk.
- Detailed development planning should recognise the localised area to the extreme north of the site which is marginally within the area of flood risk.
- No topographical low spots were identified and the existing site is not considered to be at risk from pluvial flooding.
- Overland flow flood risk is not considered an issue on the site. Mitigation measures to maintain surface water flows which apparently emanate from the A82 corridor will be required in detailed development.
- A drainage scheme for the proposed site will be designed and developed to mitigate the surface water flows generated by the development to a level agreed with the Local Authority Flood Officer. SUDS features such as ponds for treatment and attenuation will be located outwith any area which is a medium to high risk of flooding.
- A proposed surface water management strategy will manage surface water runoff from external sources by maintaining the current drainage pattern across the site without ponding or otherwise posing an unacceptable flood risk to the adjacent buildings and the site itself.

In conclusion the proposed new car park will not be at risk of flooding from any of the sources considered within the report, will not increase flood risk elsewhere in the catchment.

Appendix A - Site Location Plan

Appendix B - Selected Historical Mapping

Appendix C - Envirocheck Report

Appendix D - Conjectured Extent of Flood Risk