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Calary Inert Waste Recovery Facility
Killough Upper
Kilmacanogue
Co. Wicklow

ENVIRONMENTAL LIABILITY RISK ASSESSMENT (ELRA)

Roadstone

June 2016
SLR Ref: 501.00180.00109 ELRA Rev 0

SLR Consulting Ireland, 7 Dundrum Business Park, Windy Arbour, Dublin 14, Ireland
T : +353 1 296 4667 F : +353 1 296 4676 www.slrconsulting.com

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EXECUTIVE SUMMARY

Activity Details

Name	Calary Soil Recovery Facility
Address	Calary Quarry, Killough Upper and Glencap Commons Upper, Killmacanogue, Co. Wicklow
Licence No.	To be advised
Activities Licensed	Class R5 (P) : Recycling / reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials (Principal Activity). Class R3 : Recycling / reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), which includes gasification and pyrolysis using the components as chemicals. Class R13 : Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in Section 5(1)), pending collection, on the site where the waste is produced).

Report Preparation

This Environmental Liability Risk Assessment has been independently prepared on behalf of Roadstone Ltd. by SLR Consulting Ireland, of 7 Dundrum Business Park, Windy Arbour, Dublin 14.

Overview of the Plan

This Environmental Liability Risk Assessment was prepared in accordance with the EPA publication, *Guidance on Assessing and Costing Environmental Liabilities* (2014).

Cost Summary

As a result of this assessment, and based on a plausible worst case scenario, a requirement for financial provision of **€1,180,920** (including 20% contingency) has been calculated for the waste facility at Calary Quarry. This amount is deemed to be the maximum liability which could arise from the operation of the facility.

Financial Provision

Arising out of this assessment, Roadstone Ltd. is prepared to make the required financial provision in respect of potential environmental liability by means of a financial bond submitted under separate cover to the EPA.

Review

This ELRA will be reviewed annually and updated where necessary to take account of any facility or process changes, technology changes and costing changes (inflation). Details of the review and updates (if any) shall be included in any Annual Environmental Reports (AERs) submitted to the EPA.

1.0 INTRODUCTION AND BACKGROUND

1.1 Calary Quarry Waste Recovery Facility

Roadstone Ltd is applying to the Environmental Protection Agency (hereinafter '*EPA*' or '*the Agency*') for a waste licence in respect of a proposed inert waste recovery facility at Calary Quarry, in the townlands of Killough Upper and Glencap Commons Upper, Killmacanogue, Co. Wicklow. The principal waste activity at the application site will be the restoration of an existing quarry void using imported inert soil and stone.

The proposed waste recovery facility provides for

- Use of approximately 3,280,000 tonnes of imported inert natural materials, principally excess soil, stones and/or broken rock, to restore a large existing quarry by backfilling it to former ground level;
- Installation of temporary site infrastructure and services including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, settlement ponds, pumphouse, hardstand areas, fuel and water storage tanks, waste inspection and quarantine facility and storage sheds;
- Separation of any construction and demolition waste (principally concrete, metal, timber, PVC pipes and plastic) inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities;
- Temporary stockpiling of topsoil pending re-use as cover material for final restoration of the site;
- Restoration of the backfilled void (including placement of cover soils and seeding) and establishment of a heathland / grassland habitat similar to that which existed prior to quarrying;
- Environmental monitoring of noise, dust, surface water and groundwater for the duration of the site restoration works and for a short period thereafter.

The Applicant envisages that the importation of inert materials to the quarry will average 250,000 tonnes per annum with an annual maximum of 300,000 tonnes and that this imported material will be largely from external development or construction sites.

1.2 Site Description

The site to which this Environmental Liabilities Risk Assessment (ELRA) relates is located entirely within the townlands of Killough Upper, and Glencap Commons Upper, approximately 2.3km south-west of Kilmacanogue, Co, Wicklow and the junction of the R755 Regional Road and the N11 National Primary Road. It also lies approximately 4.4km south of the village of Enniskerry and approximately 7km south-west of Bray, Co. Wicklow.

The location of the proposed facility is shown on an extract from a 1:50,000 Discovery Series Map of the area in Figure 1 below. The proposed site infrastructure layout is indicated in Figure 2.

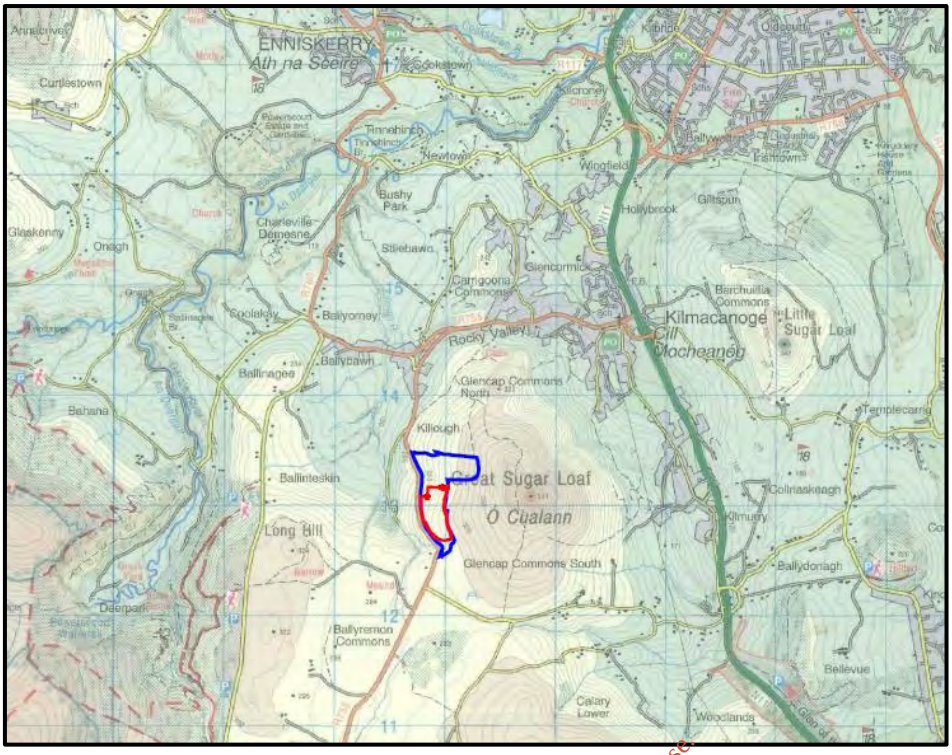

Figure 1
Site Location

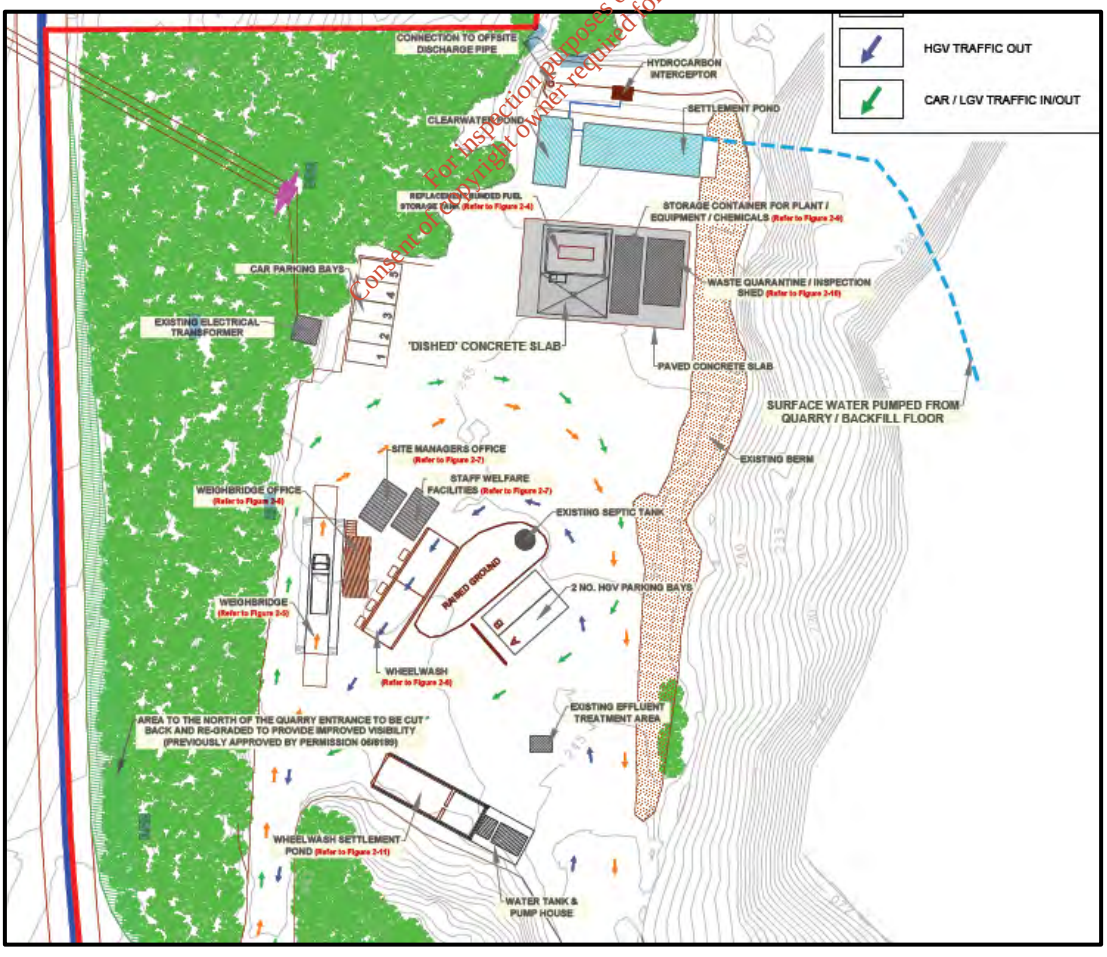

Figure 2
Waste Recovery Facility : Proposed Site Infrastructure Layout

Since quarrying activities were suspended in 2010, dewatering has been discontinued at the quarry. Natural drainage (principally surface run-off from surrounding sloping ground and rainfall) has caused water levels in the quarry void to gradually rise, from a former floor level of approximately 220mOD to approximately 244mOD, indicating water in the quarry void is approximately 24m deep.

No restoration works have been undertaken at Calary Quarry since rock extraction activities and associated aggregate production were suspended at the quarry in 2010.

The existing quarry void covers an area of approximately 9.1 hectares (9.4 acres) and is shown in an aerial view in Plate 1 below.

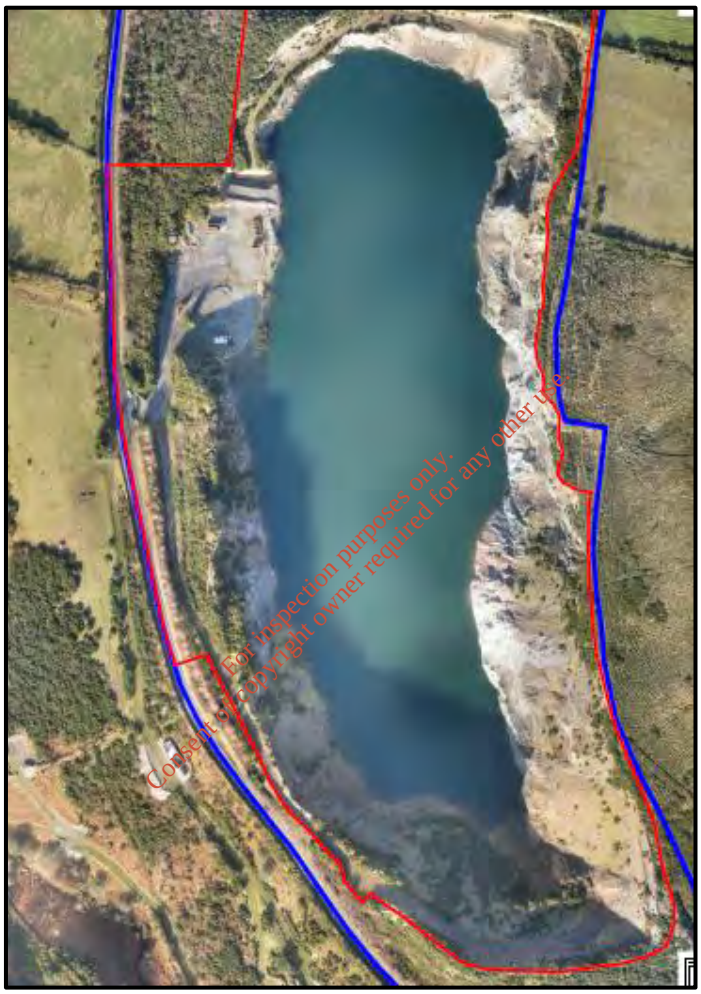

Plate 1
Aerial View of Calary Quarry

The proposed recovery of inert waste soils at Calary Quarry will provide for near complete backfilling of a large open void above the groundwater table, facilitate the restoration of the lands to a heathland / grassland habitat and improve protection to the underlying groundwater resource, which is currently classified as 'extremely vulnerable' due to the absence of any protective soil cover.

1.3 Surrounding Land Use

The application site is bound to the west by the R755 Regional Road, to the north by scrubland, to the east by commonage / grazing land across the western slope of the Great Sugar Loaf and to the south by more scrubland. Lands immediately west of the R755 Regional Road comprise a mix of agricultural grassland and scrubland.

The wider area surrounding the application site is largely rural in nature and typically comprises agricultural enterprises or small rural based enterprises interspersed with occasional isolated residential properties or small residential clusters, principally along the local road network.

The closest residential properties to the site are Kilmac Farm, Bellevue Cottage and Sugar Loaf Farm, all of which occur immediately to the south of the application site. Existing land use around the proposed recovery facility is shown in Figure 3 below.

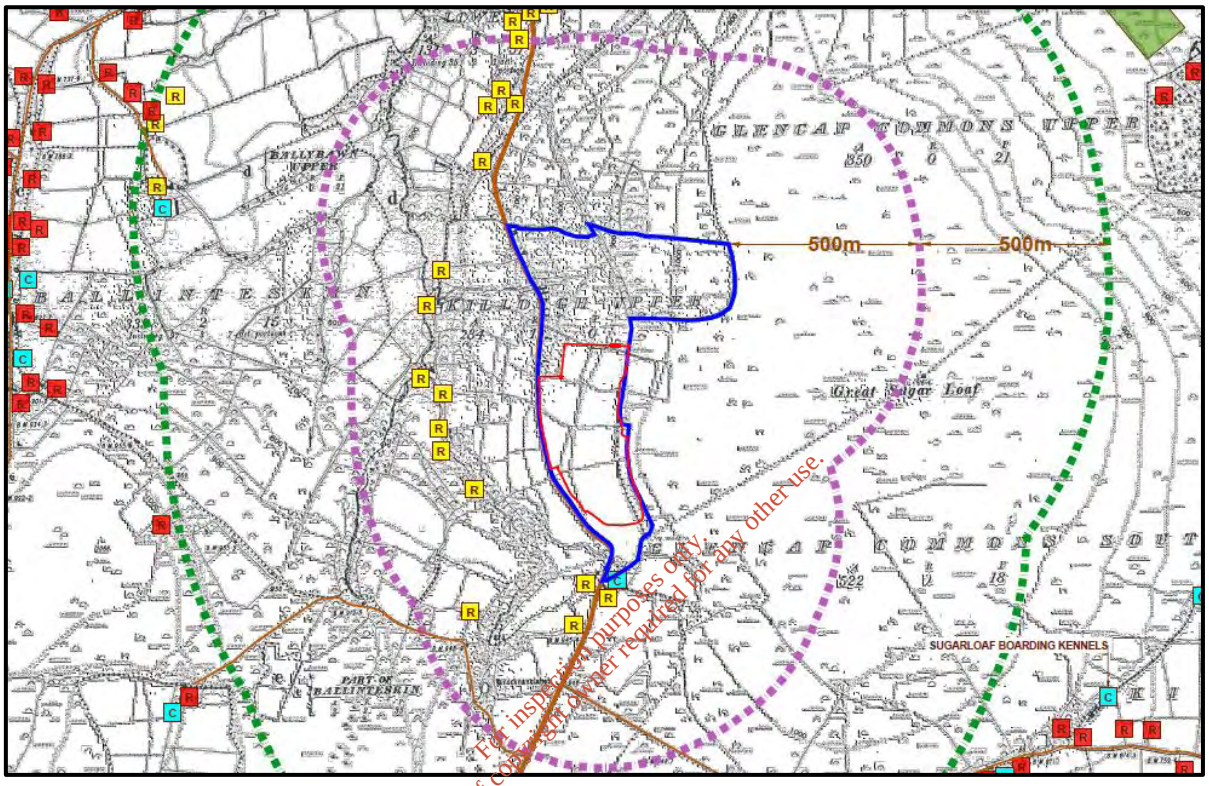

Figure 3
Surrounding Land Use

1.4 Classes of Licensed Waste Activities

The waste licence issued to Roadstone by the Environmental Protection Agency (EPA) provides for the following licensed activities (as per the Fourth Schedule of the Waste Management Acts 1996-2014).

- Class R5 (P) : Recycling / reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials (Principal Activity).
- Class R3 : Recycling / reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), which includes gasification and pyrolysis using the components as chemicals.
- Class R13: Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in Section 5(1)), pending collection, on the site where the waste is produced).

1.5 Scope of this ELRA

In preparing this ELRA, regard has been had to the requirements which are generally specified by the Agency in its guidance publications and when issuing new or revised licences. The plan identifies and addresses any potential risks to the environment and associated liabilities arising from past and planned future activities at the waste recovery facility at Calary Quarry.

Planned liabilities associated with the closure of the facility are not considered in this Environmental Liabilities Risk Assessment (ELRA) and have been identified and costed separately in the Closure, Restoration and Aftercare Management Plan (CRAMP).

2.0 CHARACTERISATION OF LOCAL ENVIRONMENT

2.1 Site Operation

The soil waste recovery facility at Calary Quarry is located entirely within a previously worked quarry and construction materials production facility operated by Roadstone Ltd. The waste facility covers an area of approximately 9.1 hectares, most of which comprises the worked-out rock quarry area and existing site access and infrastructure area.

Quarrying and associated concrete production activities at the quarry were suspended in June 2010 in response to the reduction in activity in the construction sector arising as a result of the Global Financial Crisis. No site restoration works have been undertaken at the quarry since that time. Dewatering and pumping at the quarry ceased following the suspension of activities in 2010 and since that time, water levels in the quarry have risen 25m (from 220mOD to approximately 245mOD).

2.1.1 Fuel and Oil Storage

Fuel for the proposed waste recovery facility will be stored in new (replacement) fuel storage tanks to be installed at Calary Quarry. Tanks will be bunded to provide a storage volume equivalent to 110% of the tank storage volume and will be constructed over a sealed concrete surface.

Plant to be refuelled and maintained on site principally comprises mechanical excavators and/or bulldozers. Mobile plant and equipment undertaking quarry backfilling works will be refuelled from on-site storage tanks, directly from refuelling lorries mobile or from double skin fuel bowsers over sealed concrete surfaces at the infrastructure area.

Oil and lubricant changes and servicing of wheeled or tracked plant will be undertaken over sealed concrete surfaces. Only minor maintenance of plant or equipment will be undertaken on site, with more extensive servicing of plant being undertaken periodically off-site as required at other Roadstone or third party facilities.

A small bunded tank for waste oils will be provided at the storage shed and emptied at intervals by a permitted waste contractor. Waste oils are disposed off-site at an authorised waste facility.

2.1.2 Sewerage and Surface Water Drainage Infrastructure

Potable water will be provided to the site via a pre-existing groundwater supply well. As this supply well may have collapsed, it is envisaged that it will be re-drilled if required prior to commencement of waste recovery activities at the application site.

There is currently no existing surface water drainage infrastructure across the application site. Surface water run-off over any existing paved or hardstand surfaces at the infrastructure area currently falls eastward and either

- through unsealed ground into the underlying bedrock and ultimately intercepts the groundwater table or
- flows into the pond in the quarry void.

The upper groundwater surface is likely to lie at the same level as water in the flooded quarry void (approximately 245mOD). Once it hits the groundwater body, any recharge is likely to follow regional groundwater flow westwards, down to the Killough River flowing along the valley floor.

It is envisaged that in future any surface water run-off over sealed ground and hardstanding areas around the proposed infrastructure area will be captured by gullies and buried drains and passed through a hydrocarbon interceptor (fitted with a silt trap) prior to discharge off-site (via the existing concrete pipe) to the drainage ditch along the western site boundary which ultimately flows to the Killough River.

An existing septic tank is located to the south-east of the proposed site offices at the infrastructure area. Effluent from the tank is treated at a raised treatment / percolation area located near the start of the haul road / descent to the former quarry floor, prior to being discharged to ground.

2.2 Operator Performance

2.2.1 Environmental Management Systems

Roadstone implements an Environmental Management System (EMS) at all its facilities in respect of its core quarrying and construction material production activities. In recent years it has extended the scope of the EMS to encompass inert soil / C&D waste recovery activities. As part of its EMS, Roadstone has developed standard procedures to address waste acceptance and handling activities, as well as an emergency response plan.

2.2.2 Compliance History

The excavation and blasting of rock has been undertaken at Calary Quarry for many decades and for much of this time, the quarry had the benefit of a pre- 1 October 1964 authorisation. Calary Quarry was operated in compliance with all relevant legislation and permits.

Neither Roadstone Ltd. nor any of its predecessor companies (which includes Roadstone Dublin, Roadstone Provinces and John A. Wood), has ever been convicted of any offence under the Waste Management Acts 1996 (as amended), the Environmental Protection Agency Act 2003, the Local Government (Water Pollution) Acts 1977 and 1990 or the Air Pollution Act 1987.

2.2.3 Incident History

No known environmental contamination incident has occurred at Calary.

2.2.4 Environmental Monitoring

Prior to the suspension of quarrying activities in 2010, an established programme of environmental monitoring was implemented at the site while rock extraction and aggregate processing activities were ongoing. This environmental monitoring programme complied with the conditions of planning permission for continued operation of the quarry granted by Wicklow County Council in June 2006 (Ref. No. 06/6189) and An Bord Pleanála on appeal (ABP Ref. PL 27.224400).

Environmental monitoring will be reinstated at the application site for the duration of the proposed waste recovery activities and will comply with the requirements of any planning permission or waste licence issued in respect of the facility by Wicklow County Council and the Environmental Protection Agency respectively.

2.3 Environmental Sensitivity

2.3.1 Geology

Topsoil (the upper layer of soil capable of sustaining vegetation and crop growth) and subsoil was previously stripped across the recovery facility in order to facilitate quarry development. The Teagasc / IFS soil map of the area identifies three soil types around the application site, namely shallow well drained mineral soils (AminSW), shallow / rocky / peaty soils (AminSRPT) and deep, well drained mineral soils (AminDW). Each of these soil types are classified as acidic (ie. derived from mainly non-calcareous parent materials).

The GSI quaternary / subsoil map of the area indicates that the valley to the west of the existing quarry (downslope, on the opposite side of the R755 Regional Road) is underlain by glacial till, with quartzite as the dominant clast type. It is likely that this material extends upslope, gradually thinning out as it approaches the R755. The subsoil map also indicates outcrop or subcrop occurring around the site, which is consistent with exposures visible in adjoining fields.

Calary Quarry is underlain by rocks of the Bray Head Formation. The lithologies consist of a sequence of greywackes, sandstones and shales overlain by indurated quartzites. The quartzites form the higher ground in the area, typified by the Great Sugar Loaf. The current Wicklow County Development Plan identifies the Sugar Loaf as a site of geological and geomorphological interest, largely on account of its weathered / scree slopes.

The unexcavated land surrounding the quarry void is largely underlain by glacial till with quartzite as the predominant clast (cobble) type. The thickness of the glacial till can be seen in face exposures to thin with increased elevation toward the peak of the Great Sugar Loaf.

2.3.2 Hydrology

As previously noted, the Killough River rises approximately 800m south-west of Calary Quarry, at an elevation of around 280mOD and flows northward toward the Dargle River, collecting flow from tributaries that flow down the western flank of the Great Sugar Loaf, including that which carries surface water run-off collecting in the void at Calary Quarry. The catchment area of the Killough River, upstream of its confluence with the tributary carrying discharge from the quarry is approximately 1.8 km^2.

Intermittent (temporary) springs can be seen along fractures on the exposed rock faces at the quarry. At the time the quarry was operational and being dewatered, the quarry floor was generally dry, with spring flows generally only emerging on the north-eastern and southern faces of the quarry after heavy rainfall.

Surface water runoff and shallow groundwater flow entering the application site is restricted by a number of features. As well as the drain along the R755 on the western side of the application site, there is also a drain along the eastern boundary which runs south and discharges into a small stream located to the south of the quarry.

The only surface run-off and shallow groundwater flow into the application site occurs along the northern section of the eastern boundary (which extends for approximately 350m). Consequently, water management at the application site is only required to manage surface run-off generated by rainfall directly over the quarried area, the surface water inflow along the northern part of the eastern boundary and the low volume groundwater seepage into the excavation.

As part of Ireland's obligations under the Water Framework Directive, a River Basin Management Plan (RBMP) has been prepared for the Killough River. The current plan for 2009-2015 indicates that the Killough River water body is part of the Dargle water management unit, that its status is "Moderate" and that the water body is "at risk" due to diffuse pollution inputs across the catchment. The plan notes that the water body unit is not heavily modified and sets an objective for the water body to be restored to "Good" Status by 2027. Surface water samples have previously been taken from the Killough River downstream of the quarry discharge. The test results for these samples indicated acceptable water quality standards at the time of testing.

The Office of Public Works website (www.floodmaps.ie) indicates that there are no records of historic flood events on or in the vicinity of the site. Previously, surface water run-off and discharges at the site are managed on a continual basis so that they do not increase the risk of flooding in the surrounding area.

2.3.3 Hydrogeology

The rocks of the Devil's Glen and Bray Head Formations generally have very low permeability and are categorised as Poor Aquifers (Pl) by the GSI i.e. bedrock which is generally unproductive except for local zones. Across the quarry footprint, all overburden cover has been removed and bedrock is exposed. On this basis, groundwater vulnerability at and around the application site is classified as extreme, principally because rock occurs at or near the surface.

Calary Quarry is indicated to lie within the Wicklow Groundwater Body (GWB), for which the Geological Survey of Ireland has prepared an initial characterisation study. This study suggests that the majority of the flow within this groundwater body will occur in the upper few metres, mainly in the weathered zone, in a lateral direction towards rivers and springs.

The dominant recharge process is diffuse recharge from water percolating through overlying glacial till, into the weathered zone. Higher rates of potential recharge are often expected in hilly areas due to thin subsoils, rock exposure close to the surface and high rainfall. In this area however, a large proportion of this potential recharge is rejected because the rocks are poor aquifers (with low storage capacity) and because steeply sloping ground increases surface water run-off.

At Calary Quarry, groundwater flow occurs mostly in a shallow upper weathered zone, though deeper groundwater flow is possible along fractures, joints and major faults. Recharge occurs diffusely through subsoils and via rock outcrops. Although the presence of rock close to the surface would suggest high potential recharge, this does not arise due to the effect of rejected recharge from the low permeability rock. The aquifers within the groundwater body are generally unconfined, but may become locally confined where the subsoil is thicker and/or of lower permeability. Groundwater flow around Calary Quarry is considered to recharge and discharge on a local scale.

2.3.4 Sensitive Receptors

The most sensitive ecological receptor in the vicinity of the application site is the Killough River. A discharge drain flows in a westerly direction for a short distance (approximately 250m) before entering the Killough River. As previously noted, the Killough River is a tributary of the Dargle River which is a significant Salmon and Sea Trout fishery and has been designated a "salmonid" river in accordance with EU Directive 78/659/EEC (Quality of Fresh Waters Needing Protection or Improvement in Order to Support Fish Life).

The bedrock aquifer underlying the site is also considered as a sensitive receptor. The rocks of the Devil's Glen and Bray Head Formations generally have very low permeability and are categorised as Poor Aquifers (Pl) by the GSI i.e. bedrock which is generally unproductive except for local zones.

The GSI national well database (www.gsi.ie) shows a number of wells in the immediate vicinity of the site (<1km) which are principally associated with domestic dwellings in the surrounding area. The boreholes have a yield class which is classified as *poor to moderate*.

Dwellings within the vicinity of the site generally comprise farmsteads, one off housing and isolated development along the primary and local road network. The nearest dwellings to the landholding site boundary are located to the south, west, and north of the site with the closest dwelling 195m to the south of the site. For the purposes of this assessment, site users, operatives and visitors are also considered as receptors.

There are no internationally designated nature conservation sites within 2km radius of the site. The Great Sugar Loaf, immediately east of the application site is a proposed National Heritage Area (pNHA) and contains features of both ecological and geological value and interest, with the exposed rocky outcrops and areas of scree on the mountain slopes supporting dry mountain heath and upland grassland habitats.

2.3.5 Pathways

The only surface water emission from the proposed waste recovery facility will be the off-site discharge to the existing drainage channel which leads to the tributary stream flowing to the Killough River. It is envisaged that all surface water run-off collected across the proposed recovery facility will pass through settlement ponds, grit trap and hydrocarbon interceptor prior to being discharged off-site via the existing ditch and tributary stream leading to the Killough River. The quality of this run-off could be adversely impacted if it comes into contact with loose sediment, hazardous materials or contaminated ground. Water quality is a key indicator of environmental performance and as such, the proposed on-site / off-site surface water management infrastructure is a critical environmental pathway for the facility.

Some rainfall across the site percolates down through the unsaturated zone (in soil / rock close to the ground surface) and recharges to the underlying poorly productive aquifer. In the event that some contamination of near-surface soil or ground occurs, this recharge can introduce contaminants to the groundwater body and have an adverse impact on its quality and resource potential (though this is already low given the low permeability and low yields obtained from these formations). As such, groundwater recharge through the ground is another critical environmental pathway for the facility.

Potential noise and dust emissions from the waste recovery facility may be generated by HGV truck movements and by earthworks equipment (bulldozer) engaged in haulage and backfilling activities. There are no fixed (point) noise or dust emission sources at the facility. Air borne emissions of dust and noise transmission from the waste recovery facility have the potential to impact on the occupants of the nearest residential properties.

2.4 Site Processes and Activities

The waste licence application provided for the placement, compaction and capping of approximately 1,830,000m^3 of inert soil and rock. Of this approximately 10,000m^3 will be sourced from existing overburden stockpiles on site, leaving a net import requirement of approximately 1,820,000m^3. The inert soil and rock to be placed or recycled at the recovery facility will be sourced from construction and demolition sites where inspection and/or testing have indicated that no contamination is present. The inert materials will be imported by permitted waste contractors.

3.0 RISK ASSESSMENT

3.1 Introduction

The methodology for undertaking the Environmental Liability Risk Assessment (ELRA) in respect of the soil recovery facility at Calary Quarry comprises a number of discrete elements as outlined below:

(i) Risk Identification: A list of plausible risks for the waste activity is prepared, including all potential impacts on surface water, groundwater, atmosphere, land, human health, natural habitats and protected species;

(ii) Risk Analysis: The risk analysis stage comprises establishment of risk classification criteria, followed by a risk analysis based on the selected criteria. Risk classification tables are used in order to evaluate and rank the risks relative to each other.

(iii) Risk Evaluation: The risk evaluation stage is used to assist in making decisions, using the outcomes of the risk analysis, in identifying and prioritising the identified risks for development of measures to minimise potential environmental impacts.

(iv) Risk Treatment: The risk treatment stage comprises identification and prioritisation of management and mitigation measures to reduce the risks identified in the risk evaluation process.

3.2 Risk Identification

Potential risks associated with the operation of the recovery facility were identified on foot of site visits and inspections by personnel from SLR Consulting Ireland. The potential environmental risks arising at the recovery facility and related environmental management issues were subsequently reviewed with Roadstone personnel.

The waste handling processes to be undertaken at the recovery facility will inevitably generate noise and dust at and across the licensed area.

Normal site operations, undertaken in accordance with procedures contained in the established on-site Environmental Management System (EMS), are not expected to generate any leachate or effluent, as all wastes imported, handled and placed and recovered at the facility will be inert.

Roadstone will actively monitor and manage incoming wastes to confirm that only inert materials are accepted at the facility by way of classification, compliance and verification testing of imported / deposited soil waste. Notwithstanding this, there is potential for discovery of non-inert or potentially hazardous materials, hidden within incoming loads of otherwise inert compliant waste.

Plant at the recovery facility principally will comprise mechanical excavators and/or bulldozers. Fuel for these items of plant (marked diesel / gasoline) will be stored in a fuel storage tank constructed on a sealed concrete surface which are bunded to provide a storage volume equivalent to 110% of the tank storage volume. The fuel storage tank will have a maximum capacity of 20,000 litres (possibly less).

The on-site storage of hazardous substances used in the operation and maintenance of plant and equipment (including hydraulic oil, transmission fluid, hydrocarbon fluids and gels) at the storage shed, as well as the storage of waste oils in the shed, is another potential hazard. As only minor maintenance works will be undertaken on plant at the facility, it is expected that the volume of hazardous substances stored at the facility will be low.

The location of potential pollution sources and the extent of paved and hardstanding areas across the waste recovery facility are illustrated in Drawing 1 at the back of this report.

A leak from static or mobile fuel tanks or spillage of hazardous substances, were they to arise, would most likely run-off over ground and if unimpeded, would either be picked up by gullies and drains at the infrastructure area or flow overground into collector sumps on the quarry floor, to be picked up by the surface water management system. The layout of the surface water management system at the recovery facility is illustrated on Drawing 2 at the end of this report.

Failure to intercept or contain such leaks or spills could result in contamination of the groundwater beneath the site and possibly some off-site discharge of contaminated run-off, with the facility operator responsible for clean-up costs in this scenario.

All potential risks of environmental incidents or accidents are summarised in Table 3-1 below.

Table 3-1
Potential Risks Identified for Recovery Activity

Risk ID	Process	Potential Risk
1	Stockpiling or Placement of Imported Non-Inert Materials	Excessive dust emissions from stockpiles, placed materials and site activities
2		Excessive noise emissions from site activities
3		Stockpiling or placement of non-inert non-compliant waste; contamination of ground or groundwater / surface water
4	Fuel Storage and Handling	Leaks from plant, equipment or pipelines; discharges to surface water, ground and/or groundwater
5		Spill of hydrocarbons from static / mobile storage tanks; discharges to surface water, ground and/or groundwater
6	Storage and Handling of Hazardous Materials	Spill or leak of hazardous materials stored on site (gas-oil, hydraulic oil, engine oil, transmission oil, waste oil etc.); discharges to surface water, ground and/or groundwater
7	Leakages from Septic Tank	Discharges to ground and groundwater
8	Leakages from Mobile Plant and Equipment	Spillage or leakage of fuel from HGVs, tipper trucks, bulldozers and other mobile site equipment; discharges to surface water, ground and/or groundwater
9	Weather	Flooding on site causing uncontrolled discharge

3.3 Risk Analysis

A list of plausible risks has been identified, which include abnormal but possible and plausible incidents occurring that could give rise to environmental liabilities. The risk analysis is based on the following likelihood and consequence risk classification tables, as outlined in Table 3.2 and Table 3.3 below. The risks identified are tabulated in Table 3.4 and assessed in terms of likelihood and consequence using the risk classification tables.

Table 3-2
Risk Classification Table – Likelihood

RATING	LIKELIHOOD	
	Category	**Description**
1	Very Low	Very low chance of hazard occurring
2	Low	Low chance of hazard occurring
3	Medium	Medium chance of hazard occurring
4	High	High chance of hazard occurring
5	Very High	Very high chance of hazard occurring

Table 3-3
Risk Classification Table – Consequence

RATING	LIKELIHOOD	
	Category	**Description**
1	Trivial	No impact or negligible change to the environment
2	Minor	Minor impact / localised or nuisance
3	Moderate	Moderate impact to environment
4	Major	Severe impact to environment
5	Massive	Massive impact to a large area, irreversible in medium term

Table 3-4
Risk Analysis

Risk ID	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
1	Stockpiling or placement of imported non-inert materials	Dust generation from stockpiles, placed materials and site actvities	Reduction in air quality; inhalation of dust particles Potential health or nuisance impact	3	Slight increase in dust inhalation, principally by site users. Prolonged increase potentially damaging to health.	2	Impact attenuated by separation distance, dust suppression, intervening vegetation and frequent seasonal rainfall. Standard dust suppression mitigation measures will ensure no reduction in air quality	6
2	Stockpiling or placement of imported non-inert materials	Noise generation by moving plant and equipment	Increase in ambient noise on site and at nearby properties. Potential health or nuisance impact	3	Existing raised ambient noise level. Slight increase in noise exposure, principally for site users. Prolonged increase potentially damaging to health.	2	Noise impact attenuated by separation distance and measures to limit emissions at source or screen over intervening distance.	6
3	Stockpiling or placement of imported non-inert materials	Contamination from non-inert non-compliant waste	Potential contamination of ground or locally important aquifer. Potential contamination of surface water.	3	Finite volume of contaminated materials. Placed materials surrounded by low permeability clay.	2	Operator applies measures to ensure all waste accepted at facility is inert. including establishing origin of incoming wastes. Hydrocarbon interceptor and silt trap installed	6

Risk ID	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
4	Fuel Storage and Handling	Leaks from plant or equipment; discharge to surface water, ground and/or groundwater	Potential contamination of surface water. Potential contamination of ground, aquifer and/or local supply wells.	4	Potential for significant volume loss. Potential impact on Killough River and River Dargle. Some possible impact on local groundwater abstraction wells. Groundwater flow into site due to drawdown.	2	Plant, equipment and pipelines regularly maintained and inspected. Hydrocarbon interceptor and silt trap installed. Potential to contain spillage on site before discharge to tributary of Killough River	8
5	Fuel Storage and Handling	Spill of hydrocarbons from static / mobile fuel tanks : discharge to surface water, ground and/or groundwater	Potential contamination of surface water. Potential contamination of ground, aquifer and/or local supply wells.	4	Potential for large volume loss, impacting Killough River and River Dargle. Some possible impact on local groundwater abstraction wells. Groundwater flow into site due to drawdown.	2	Storage tanks fully bunded and regularly inspected and tested. Hydrocarbon interceptor and silt trap installed. Potential to contain spillage on site before discharge to tributary of Killough River	8
6	Storage and Handling of Hazardous Materials	Spill or leak of hazardous materials stored on site (gas-oil, hydraulic oil, engine oil, waste oil etc.); discharge to surface water, ground and/or groundwater.	Potential contamination of surface water. Potential contamination of ground, aquifer and/or local supply wells.	4	Loss of hazardous and persistent material. Finite volumes stored. Potential impact on Killough River and River Dargle.	2	Materials held in storage shed. Drums and containers placed on bunded pallets. Tanks, drums and pallets regularly inspected and tested. Hydrocarbon interceptor and silt trap installed.	8
7	On-site septic tank	Leakage of sewage to ground or groundwater	Potential contamination of ground or aquifer	3	Loss of sewage. Finite volumes in tank.	2	Tank regularly maintained and inspected.	6

Risk ID	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
8	Traffic	Spillage or leakage of fuel from HGVs, trucks and mobile site equipment. Spillage during refuelling discharges to surface water, ground and/or groundwater.	Potential contamination of surface water Potential contamination of ground, aquifer or local supply wells.	3	Losses finite (low volume) and dispersed.	2	HGVs and mobile site equipment regularly maintained and inspected. Hydrocarbon interceptor and silt trap installed.	6
9	Weather	Flooding on site causing uncontrolled discharge	Potential contamination of surface water. Potential contamination of ground, aquifer and/or local supply wells.	3	Potential for large volume loss and impact due to elevated suspended solids.	1	The published flood data for a 1% AEP event indicates out of bank flooding along the Killough River, much as would be expected along the floodplain of such a stream. The planned facility is not at risk of flooding	3

3.4 Risk Evaluation

The environmental risks identified above are re-tabulated below in Table 3-5 to assist in the prioritisation for risk treatment purposes

Table 3-5
Risk Evaluation Table

Risk ID	Process	Potential Risks	Consequence Rating	Likelihood Rating	Risk Score (Consequence x Likelihood)
4	Fuel Storage and Handling	Leaks from plant or equipment; discharge to surface water, ground and/or groundwater	4	2	8
5	Fuel Storage and Handling	Spill of hydrocarbons from static / mobile storage tanks: discharge to surface water, ground and/or groundwater	4	2	8
6	Storage and Handling of Hazardous Materials	Spill or leak of hazardous materials stored on site (gas-oil, hydraulic oil, engine oil, transmission oil, waste oil etc.), discharge to surface water, ground and/or groundwater	4	2	8
1	Stockpiling or placement of imported non-inert materials	Dust generation from stockpiles, placed materials and site activities.	3	2	6
2	Stockpiling or placement of imported non-inert materials	Noise generation by moving plant and equipment	3	2	6
3	Stockpiling or placement of imported non-inert materials	Contamination of ground or groundwater by non-inert non-compliant waste	3	2	6
7	Leakages from Septic Tank	Discharges to ground and/or groundwater	3	2	6
8	Traffic	Spillage or leakage of fuel from HGVs, tipper trucks, bulldozers and other mobile site equipment, Spillage during refuelling discharges to surface water / groundwater	3	2	6
9	Weather	Flooding on site causing uncontrolled discharge	3	1	3

The risk matrix is displayed in Table 3-6 below. In line with the EPA Guidance, the risks have been colour coded in the matrix to provide a broad indication of the critical nature of each risk to facilitate prioritisation of risks for treatment. The matrix allows risks to be easily displayed and prioritised.

Table 3-6
Risk Matrix

Likelihood							
	Very High	5					
	High	4					
	Medium	3					
	Low	2			1, 2 ,3, 7, 8	4, 5, 6	
	Very Low	1			9		
			Trivial	Minor	Moderate	Major	Massive
			1	2	3	4	5

Consequence

The risk matrix indicates that the bulk of the identified risks lie in the green zone, indicating the need for continuing awareness and regular ongoing monitoring. Three of the risks lie within the amber zone, requiring treatment through mitigation or management action. These are ID4 – Leaks from plant or equipment, ID 5 – Spill of hydrocarbons stored in static / mobile tanks and ID 6 – Spill or leak of hazardous materials stored on site.

3.5 Risk Treatment

The output of the risk treatment process is the development of a statement of measures to be taken to minimise the environmental risk of the activity. The risk reduction due to existing mitigation measures is indicated in Table 3.7.

Table 3.7 allocates identified mitigation measures to a 'risk owner'. Roadstone will maintain and update a version of this table to inform its Risk Reduction Programme for the recovery facility. The responsibility may be delegated from the Location Manager to other Roadstone personnel, depending on work commitments and levels of activity at the recovery facility.

The Risk Reduction Programme is a dynamic process that will be regularly reviewed and updated to reflect changes that occur at the recovery facility. New risks may emerge with new processes or new methods of working. Additional hazards can arise from the use of new materials for maintenance or fuelling at the recovery facility. Additional mitigation measures can become available or better techniques developed. The staff structure can change and new responsibilities allocated to the site management team.

Table 3-7
Risk Reduction due to Existing Mitigation Measures

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be Taken	Outcome	Action	Date for Completion	Owner / Contact Person
4	Leaks from plant, equipment or pipelines; discharge to surface water, ground and/or groundwater	8	Spill kits comprising containment booms and absorbent materials to be available on site. Regular visual inspection and integrity testing of mobile plant and equipment undertaken to identify small or undetected leaks.	Reduced likelihood of leaks to surface water, ground and/or groundwater	Ongoing inspection and monitoring	Ongoing	Location Manager
5	Spill of hydrocarbons stored in static / mobile tanks; discharge to surface water, ground and/or groundwater	8	Regular tank and bund integrity assessments to be undertaken. Tank and bund to be visually inspected annually. Bund integrity test to be undertaken every three years. Bunded fuel tank to be separated from traffic by bollards / large tyres to protect from mobile plant impact. Level alarms to be installed in storage tank. Any fuel storage drums and containers to be inspected at least quarterly. Re-fuelling to take place over concrete paved surfaces (including adjacent to fuel storage tank). Proposed surface water management and planned downstream treatment infrastructure (hydrocarbon interceptor) to reduce the scale and impact of a potential fuel leak or spill. Spill kits comprising containment booms and absorbent materials to be available on site. Emergency Response Procedures and Plans to be in place detailing the actions should a major leak or spillage event occur.	Reduced likelihood of spills to surface water, ground and/or groundwater	Ongoing inspection and monitoring	Ongoing	Location Manager

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be Taken	Outcome	Action	Date for Completion	Owner / Contact Person
6	Spill or leak of hazardous materials stored on site	8	All hazardous fluids and materials to be stored at the on-site maintenance shed in accordance with regulations until they are either recovered (treated) or disposed of at an appropriate off site waste management facility. All tanks, drums and containers will be subject to routine inspection and maintenance as part of scheduled site inspections (at least quarterly). Hydraulic oil, transmission fluid and hydrocarbon fluids and gels etc. to be stored on bunded pallets in storage shed. Storage shed to be placed on drained concrete slab to minimise infiltration to ground. Material Safety Data Sheets for all hazardous liquids to be stored on site. Spill kits available in workshop to contain minor spills. Emergency Response Procedures and Plans to be in place detailing the actions should a spillage event occur. Emergency Response Training to be carried out as part of Environmental Awareness Training for all members of staff. Material storage procedures to be in place and integrated into Environmental Awareness Training. Procedures to outline how hazardous materials are to be stored to prevent environmental pollution. Site inspection checklist to call up checks on spill containment measures, content of spill kits, hazardous materials storage, bunds, spill trays, surface water infrastructure, hydrocarbon interceptor, etc.	Reduced likelihood of spills to surface water, ground and/or groundwater	Ongoing inspection and monitoring	Ongoing	Location Manager

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be Taken	Outcome	Action	Date for Completion	Owner / Contact Person
1	Dust generation from stockpiles or placed materials	6	Employees and visitors to be issued with dust masks, if warranted. Surfaces damped down during prolonged dry spells to keep yards and roads dust free. Wheelwash / vehicle wash provided at exit from facility to be maintained in good working order. All traffic movements after the wheelwash will be over paved surfaces to minimise mud pick-up.	Reduced likelihood of excessive dust emissions.	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager
2	Noise generation by moving plant and equipment	6	Employees and visitors to be issued with ear protectors, if warranted. Where monitoring indicates that noise emissions from the recovery facility are excessive, the operator will employ further mitigation in the form of improved working practices, noise screening and/or reduced sound output from (or improved performance of) plant and machinery.	Reduced likelihood of excessive noise emissions.	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager
3	Contamination from non-inert non-compliant waste	6	Operator to design and implements robust waste acceptance procedures which ensure that all wastes accepted at the recovery facility are inert. Operator to confirm customer's business activities and credentials prior to issuing authorisation to deliver waste to recovery facility Operator to also establish site of origin and its development history for each waste consignment accepted at the recovery facility.	Reduced likelihood of contaminated waste import.	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager
7	Leakage from septic tank	6	Septic tank will be subject to routine inspection and maintenance as part of scheduled site inspections (at least quarterly). Tank to be emptied at regular intervals.	Reduced likelihood of leaks to ground and groundwater.	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be Taken	Outcome	Action	Date for Completion	Owner / Contact Person
8	Spillage or leakage of fuel from HGVs, tipper trucks, bulldozers and other mobile site equipment.	6	Re-fuelling to take place over concrete paved surfaces (including adjacent to fuel storage tank) Proposed sub-surface drainage at these areas and downstream treatment infrastructure (hydrocarbon interceptor) to reduce the scale and impact of a potential fuel leak or spill.	Reduced likelihood of fuel spills to surface water ground and/or groundwater	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager
8	Spillage during refuelling; discharge to ground and groundwater / surface water.	6	Bollards / large tyres to be placed around the fuel tank to prevent mobile plant from colliding into / impacting with it. Spill kits comprising containment booms and absorbent materials to be available on site. Regular visual inspection and integrity testing of mobile plant and equipment to be undertaken to identify small or undetected leaks	Reduced likelihood of fuel spills to ground or groundwater / surface water	Ongoing inspection and monitoring	Ongoing	Location Manager / Waste Facility Manager
9	Flooding on site causing uncontrolled discharge.	3	Monitoring of extreme weather events. Revise emergency response procedures as required.	Increased awareness of response procedures and reduced impact.	Revision of emergency response procedures.	Ongoing	Location Manager / Waste Facility Manager

4.0 IDENTIFICATION OF PLAUSIBLE WORST CASE SCENARIO

The ELRA for the waste recovery activity at Calary Quarry has identified a small number of risks with a major consequence and these formed the basis of further assessment to identify the plausible worst case scenario.

This assessment determined that the most plausible worst-case environmental scenarios relate to the spillage / leakage of hydrocarbons stored in fuel tanks impacting on surface water and groundwater (ID 4 and ID 5) and spillage / leakage of hazardous materials stored on site that could also impact on surface water or groundwater (ID 6).

Under the worst case scenario, it is assumed that existing / proposed mitigation measures are either:

(a) not in place, or
(b) in place, but are either not implemented or fail to function as intended.

If this scenario was to transpire, it is considered that it would not precipitate any other environmental incidents, nor would it increase the likelihood that any other identifiable environmental risks would occur.

It is noted that given the nature of the wastes being handled and the location and proposed configuration of office and storage facilities on site, the risks associated with a fire outbreak are considered to be minimal. Risk of injury or death to employees or the public as a result of a fire would be covered by Employer's Liability and Public Liability insurance cover. Any fire affecting plant / equipment or the office would be covered by general insurance.

It is considered that any potential injuries or illnesses caused to site employees or the public by dust or noise emissions would be covered under Employer's Liability and Public Liability insurance cover. The risk of occurrence of these events is considered very low, provided mitigation measures outlined above are fully implemented.

5.0 QUANTIFICATION AND COSTING

This assessment determined that the most plausible worst-case environmental scenarios relate to the spillage / leakage of hydrocarbons (ID 4 and ID 5) and/or hazardous materials (ID 6) stored on site that could impact on surface water and/or groundwater. Given the potential for a large volume loss, it is considered that loss of fuel from a filled fuel storage tank (ID 5) presents the greatest level of environmental risk for the waste recovery activity.

The plausible worst case scenario with the highest cost (Risk ID 5) is quantified and costed in this Section and in particular, in Table 5-1 below. For the purposes of this exercise, it is assumed that failure of the fuel tank occurs when full, with much of the stored fuel discharged to the surface water drainage system and some infiltration into the surrounding hardstanding area. The proposed storage tank at the recovery facility will hold no more than 20,000 litres of fuel.

Should this worst-case scenario ever materialise, it is likely that the bulk of the fuel released will run-off over the hardstanding at the ground surface and be discharged to the tributary of the Killough River and ultimately to the Dargle River and that a smaller proportion of fuel will percolate to ground to potentially impact the underlying aquifer.

The dewatering of the quarry at Calary Quarry will generate a cone of depression around the facility. Any spilled fuel or leak from on-site storage tanks which migrates into the ground and through underlying bedrock will intercept the cone of drawdown and migrate laterally toward the quarry void, away from off-site wells and other potential groundwater receptors.

The increased depth to groundwater associated with pumping at Calary Quarry reduces the vulnerability of groundwater to a fuel spillage. Vertical migration of fuel to the underlying groundwater table can only occur via vertical fractures in the overlying unsaturated bedrock. The presence of this unsaturated zone essentially impedes or slows the movement of fuel spills to the groundwater table.

As long as a cone of depression and lowered groundwater levels are maintained at Calary Quarry, there will be no rapid flow of contaminants off-site and any fuel spill can be captured within the cone of depression created by the dewatering regime.

It is considered prudent, for the purposes of costing up this worst case scenario, to incorporate financial provision for remediation of impacts on surface water drainage systems and natural watercourses around the recovery facility and on groundwater beneath it.

In the event that the worst case scenario was to transpire, the associated land and groundwater remediation costs which are likely to be incurred are identified, quantified and costed in Table 5-1 in order to establish an appropriate level of financial provisioning to be made in respect of the recovery facility.

The remediation response to a large fuel spill is likely to comprise the following:

(i) mobilisation of emergency response contractor to site for immediate spill containment and site clean-up;
(ii) collection and removal off-site (as contaminated waste) of captured fuels, absorbent materials, impacted soils and contaminated surface waters (from settlement lagoons), all of which are assumed to be hazardous;
(iii) provision for placement of booms across the Killough River for an extended period, river bank clean up, restocking, remediation / replanting and any consequential losses to cattle.
(iv) construction of a temporary bunded facility to store any excavated materials prior to removal off-site;
(v) the cost of ground investigation to delineate the extent of the area affected by the spill;
(vi) the cost of constructing and commissioning any abstraction well(s) into the bedrock;

(vii) installation and commissioning of an on-site treatment system to pump contaminated groundwater out of ground and pass it through oil interceptor and carbon filter and discharge it back to ground;
(viii) maintenance costs for product recovery system, to include consultancy costs, regular daily visits, laboratory analyses, emptying and disposal of recovered products, changing and disposal of carbon filter material.

The cost of excavating and removing / remediating contaminated soil or groundwater material is very much dependent on the volume and degree / nature of any contamination which might occur or be encountered. The volume of impacted ground / materials assumed for costing purposes has had regard both to the relatively low permeability of the bedrock underlying the recovery facility at Calary Quarry and the location of the fuel storage tank over paved ground (which drains to the on-site drainage system).

As a worst-case scenario, we have accordingly recommended the provision of **€1,008,360** for remediation / evacuation of contaminated groundwater in the event of a large scale fuel spillage (inclusive of 20% contingency). It should however be recognised that following implementation of all mitigation measures, the probability of such an occurrence materialising is considered low.

Table 5-1
Quantification and Costing of Plausible Worst Case Scenario

Task	Description	Quantity (No.)	Measurement Unit	Unit Rate (€)	Cost (€)	Source of Unit Rates
Response to: Risk ID 5 Spill from fuel tank (maximum capacity 20,000 litres)	Mobilising emergency response contractor to site for spill containment and site clean-up	5	Days	3,750	18,750	Enva / Verde / Rilta
	Trial pits	10	No.	150	1,500	SLR Consulting Ireland
	Soil quality testing (incl. leachate tests)	25	Sample	150	3,750	Jones Environmental Laboratory
	Drill and install groundwater monitoring wells around affected area to average depth of 50m	6	No.	1,500	9,000	Causeway Geotech Ltd
	Purging and sampling of wells over five years, with following frequencies: Year 1 –monthly : Year 2 – bimonthly Years 3-5 - quarterly	30	Visit	1,000	30,000	SLR Consulting Ireland
	Testing of groundwater samples (6 No.) from wells 30 rounds	180	Sample	150	27,000	Jones Environmental Laboratory
	Construction of temporary lined contaminated soil holding area	800	m^3	50	40,000	SLR Consulting Ireland
	Excavation of contaminated ground	750	Tonne	5	3,750	EPA Unit Cost guidance (upper bound)
	Removal and disposal off site (as hazardous waste) of up to 1,000 tonnes of contaminated ground, interceptor sludge, captured fuel and absorbent materials	750	Tonne	150	112,500	Rilta / EPA Unit Cost Guidance (upper bound)
	Transport of contaminated soil of up to 1,000 tonnes of contaminated ground, captured fuel and absorbent materials	750	Tonne	15	11,250	Rilta

Task	Description	Quantity (No.)	Measurement Unit	Unit Rate (€)	Cost (€)	Source of Unit Rates
Response to: Risk ID 5 Spill from fuel tank (maximum capacity 20,000 litres)	Excavation of uncontaminated on-site materials and re-use / placing to backfill excavated voids	750	Tonne	8	6,000	NRA Rates Database
	Removal and treatment of captured fuel / waters at settlement ponds upstream of discharge point	300	m^3	120	36,000	Rilta
	Drain Jetting	150	m	2	300	USSR / Boyne Waste
	Installation, operation and maintenance of booms at stream over extended period	1	Year	100,000	100,000	Regenesis Remediation SLR Consulting – estimate based on previous experience
	Allowance for remedy of any consequential losses arising from impact to stream (eg ecological survey, restocking, river bank clean-up / remediation / replanting, compensate for livestock impact)	1	Unit	200,000	200,000	SLR Consulting - estimate based on previous experience of fuel discharge to river
	Inspection and testing of river daily for one week following spill and as follows: - Weekly for 11 weeks - Monthly for 9 months - Biannually for 4 years	33	Visit	500	16,500	SLR Consulting
	Installation, operation and maintenance of pumping and treatment system for groundwater contamination	1	Year	200,000	200,000	Regenesis Remediation costs
	Environmental Consultancy Costs (reporting, supervision and surrender application)	40	Days	600	24,000	SLR Consulting Ireland
Total (€)					**€840,300**	
Plus 20% Contingency					**€1,008,360**	

6.0 CONCLUSIONS

6.1 Environmental Liabilities

An Environmental Liabilities Risk Assessment has been carried out for the planned soil waste recovery facility at Calary Quarry, Killough Upper and Glencap Commons Upper, Kilmacanogue, Co. Wicklow. The ELRA has been prepared in accordance with the EPA publication *Guidance on Assessing and Costing Environmental Liabilities (2014).*

Fuel / hazardous materials storage and handling (Risk ID 4, ID 5 and ID6) have been identified as the highest environmental risks at the planned soil waste recovery facility. Due to the potential for large volume loss for Risk ID5, it is assumed for the purposes of assessing potential environmental liability, that the worst case scenario would involve a leak or spill from the fuel storage tank with potentially major consequences for surface water quality in the Killough River downstream and/or underlying (poor) groundwater aquifer.

If this scenario was to transpire, it is considered that it would not precipitate any other environmental incidents, nor would it increase the likelihood that any other identifiable environmental risks would occur.

The environmental liability has been assessed on the basis of the worst case scenario outlined above. Were it to materialise, the maximum environmental liability which could be incurred is estimated to be of the order of €1,008,360 (inclusive of 20% contingency).

6.2 Financial Provision for Environmental Liabilities

Roadstone Ltd. has the following insurance cover in place by way of provisioning for potential environmental liabilities in respect of the planned waste recovery facility at Calary Quarry;

(i) Employers Liability Insurance – Indemnified for up to €22.7 million.
(ii) Public Liability Insurance – Indemnified for up to €13 million.

Details of Roadstone's current employers liability insurance and public liability insurance are provided in Appendix A.

Should the Agency raise any concerns in respect of any clauses or provisions of these insurances (such as limits on cover, policy exclusions or deductibles), Roadstone will endeavour to modify the policy terms to satisfy the Agency's specific requirements in respect of provision for potential environmental liabilities (provided it is practicable and cost effective to do so).

Roadstone will make the financial provision necessary to cover the amount of the assessed environmental liability by lodging an insurance company bond with the Agency, coupled with an agreement which will empower it to apply such security (or part thereof as may be required) in the event that a liability event materialises at the waste recovery facility at Calary Quarry.

The initial amount of the bond will be agreed with the Agency and adjusted as necessary each year thereafter to take account of ongoing review and revisions of the ELRA.

7.0 CLOSURE

This report has been prepared by SLR Consulting Ireland (SLR) with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the Client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Roadstone Ltd; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DRAWINGS

Drawing 1
Pollution Sources and Paved Areas

Drawing 2
Surface Water Management System

NOTES

1. *'Orthomosaic produced from Aerial Photography flown February 2015 by SLR Consulting Ireland (IAA Permit No. 04/2015) www.slrconsulting.com Tel. +353-1-2964667.*

Orthomosaic produced using Ground Control Points; Related to Irish Transverse Mercator Coordinate System and OS Malin Head Level Datum.

The accuracy of the orthomosaics and the digital elevation models (DEM) strongly depends on the flight height, lighting conditions, availability of textures, image quality, overlap, and type of terrain. Contours / 3D data relates to the surface model and not terrain levels. Typical accuracies: E: 0.05 m; N:0.05 m; Levels: 0.30 m.

All Dimensions and Levels are to be checked on site.

2. Ordnance Survey Ireland Licence No. SU 0000716(C) Ordnance Survey Ireland & Government of Ireland

LEGEND

- ROADSTONE LIMITED LAND INTEREST (c.25.4 Hectares)
- PLANNING APPLICATION AREA (c.9.1 Hectares)
- POLLUTION SOURCES
- PAVED AREA

N
W
E
S

HYDROCARBON INTERCEPTOR

REPLACEMENT BUNDED FUEL STORAGE TANK

STORAGE CONTAINER FOR PLANT / EQUIPMENT / CHEMICALS

WASTE QUARANTINE / INSPECTION SHED

'DISHED' CONCRETE SLAB

PAVED CONCRETE SLAB

EXISTING SEPTIC TANK

EXISTING EFFLUENT TREATMENT AREA

SECURITY GATE

0 5 10 15 20m 30 40 50

Metres 1:500

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

ROADSTONE LIMITED

ELRA

INERT SOIL WASTE RECOVERY FACILITY

CALARY QUARRY,
KILMACANOGE, CO. WICKLOW

POLUTION SOURCES & PAVED AREAS

DRAWING 1

Scale: 1:500 @ A3

Date: JUNE 2016

00180.00109.0.DWG_1.Pollution Sources & Paved Areas.dwg

N
W
E
S

INTERMITTENT SPRING

CONNECTION TO OFFSITE DISCHARGE

HYDROCARBON INTERCEPTOR

SETTLEMENT POND

CLEARWATER POND

CULVERT

SURFACE WATER PUMPED FROM QUARRY / BACKFILL FLOOR

INTERMITTENT SPRING

R755 REGIONAL ROAD

0 20 40 60 80m 120 160 200

Metres 1:2000

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000716 (C) ORDNANCE SURVEY IRELAND & GOVERNMENT OF IRELAND

2. TOPOGRAPHIC / AERIAL SURVEY SUPPLIED BY SLR CONSULTING IRELAND

LEGEND

- PLANNING APPLICATION AREA (c.9.1 Hectares)
- EX-PIT STREAM / DRAIN
- TEMPORARY SPRING
- DIRECTION OF DRAINAGE

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

ROADSTONE LIMITED

ELRA

INERT SOIL WASTE RECOVERY FACILITY

CALARY QUARRY,
KILMACANOGE, CO. WICKLOW

SURFACE WATER MANAGEMENT SYSTEM

FIGURE 6-5

Scale	Date
1:2,000 @ A3	JUNE 2016

00180.00109.0.DWG_2.Surface Water Management System.dwg

APPENDIX A

Details of Roadstone Limited Current Insurances

XL Catlin
20 Gracechurch Street
London EC3V 0BG
United Kingdom
Phone +44 (0)20 7933 7000
Direct +44 (0)20 7933 7944
Fax +44 (0)20 7469 1025

Certificate of Employers and Public/Products Liability

Name of Insured	Roadstone Limited
Address	Fortunestown Tallaght Dublin 24 Ireland
Insurers	XL Insurance Company SE XL House 70 Gracechurch Street London EC3V 0XL
Policy Number	GB00002926LI16A (Employers Liability) GB00002928LI16A (Public/Products Liability) GB00010400LI16A (Public/Products Liability Excess)
Period Liability	1st February 2016 to 31st January 2017
Business:	Activities of the Insured as advised to the Company
Limits of Indemnity	Employers Liability €22,700,000 each and every event unlimited per Policy Year Public Liability €13,000,000 each and every event unlimited per Policy Year Products Liability €13,000,000 each and every event and in the aggregate per Policy Year Further Excess Layers are in place with other Insurers Financial Loss €800,000 in the aggregate per Policy Year
Clauses (PL/Products)	Indemnity to Principals Contractual Liability Cross Liabilities
Excesses	€5,000 Bodily Injury €10,000 Products and Property Damage €20,000 Breaking out Costs and Separation of Products €30,000 Financial Loss €30,000 Professional Indemnity

SIGNED
For and on behalf of XL Insurance Company SE
Subject to the terms and conditions of the policies currently in force, issued by XL Insurance Company SE and corresponding with the aforementioned policy numbers.

DATED 22nd January 2016