ATTACHMENT I2 – SURFACE WATER IMPACT

The proposed inert waste recovery facility at Calary Quarry is located upslope, up gradient and east of the Killough River, which flows along the floor of a minor valley formed by the west-facing slope of the Great Sugar Loaf and the east-facing slope of Long Hill. The river flows northwards and receives all discharge water from the quarry via a drainage ditch which initially runs along the R755 Regional Road and western quarry boundary before it turns and runs down the western slope of the Great Sugar Loaf.

The Killough River is a tributary of the Dargle River and the confluence between the two is located at Tinnehinch, to the south of Enniskerry village and just over 3km north of the application site. The River Dargle enters the sea at Bray, Co. Wicklow and has been designated a "salmonid" river in accordance with national and EU legislation.

Prior to 21010, the application site was operated as a quarry. The surface water management system at the quarry comprised a series of sumps on the quarry floor which pumped surface water run-off to a series of overground settlement tanks at the infrastructure area at the upper level. Treated wastewater from these tanks was discharged off-site to the Killough River, in accordance with an effluent discharge licence issued by Wicklow County Council (Ref. No 27.WW.378).

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), together with minor groundwater inflows, has caused water levels in the quarry void to gradually rise from a former floor level of approximately 220mOD to approximately 245mOD, forming a large pond within the existing quarry void which is up to 25m deep at its deepest point.

There is currently no surface water drainage infrastructure at the application site. 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 outfall pipe) to the drainage ditch along the western site boundary which ultimately flows to the Killough River.

As backfilling of the quarry proceeds over the short to medium term, the flow of surface water run-off into the quarry will be minimised wherever possible by the construction of drainage channels around the edge of the quarry. These channels will collect some over ground surface water flows from higher ground and divert them directly (without further treatment) to the existing natural drainage network surrounding the quarry.

During the backfilling operations, the upper surface of the backfilled soil will be graded so as to ensure that surface water run-off falling over the quarry footprint falls to sumps at temporary low points. Any groundwater daylighting in the quarry faces during the backfilling phase will also be permitted to flow into the quarry and to run over filled ground to these sumps.

The temporary sumps will effectively function as primary settlement ponds and water collecting in them will be pumped (causing minimum agitation to ponded water) to the proposed new settlement ponds to be constructed on the northern side of the infrastructure area at the upper level and will be retained there for sufficient time to allow sediments / suspended solids to fall out of solution. Thereafter run-off will be passed through a proposed new silt trap / hydrocarbon interceptor before being discharged off-site to the existing drainage network leading to the Killough River.

Potential impacts of backfilling and restoring the former quarry using inert materials have been assessed and it is considered that in the absence of mitigation measures, the development could have the potential to negatively impact surface water quality, particularly if contaminated soils were placed at the site, fuel or chemical spillages occurred or discharges to the Killough River had high levels of suspended solids, organic contaminants or nutrients.

It is therefore proposed that, as part of the proposed development, a number of mitigation measures will be incorporated into the proposed restoration and backfilling scheme to protect surface water, prevent possible accidental discharge of fuel or chemicals and detect / monitor potential adverse impacts, including reinstatement and upgrading of the former surface water management system to provide settlement ponds, a grit trap and hydrocarbon interceptor to remove sediment and any potential hydrocarbon contamination prior to off-site discharge.

In the longer term, toward the end of the quarry backfilling works, ground contours within and around the backfilled quarry void will be modified to ensure that surface water run-off across the area is directed to a drainage ditch / channel to be developed along the western site boundary, as indicated in the proposed final quarry restoration plan (refer to Drawing D2-1 in Attachment D2).

Details of the existing surface water environment and the impact of the proposed waste recovery facility and associated emissions thereon are provided in Chapter 6 of the Environmental Impact Statement which accompanies this waste licence application.

SW1 (2015)
SW2 HISTORICAL

SW2 (2015)
SW3 HISTORICAL

DISCHARGE POINT (2015)

SW1 (HISTORICAL)

N
W
E
S

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

ROADSTONE LIMITED LAND INTEREST (c.25.4 Hectares)

PLANNING APPLICATION AREA (c.9.1 Hectares)

SURFACE WATER MONITORING LOCATION

0 80m 200

Metres 1:2500

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ROADSTONE LIMITED
WASTE LICENCE APPLICATION

INERT SOIL WASTE RECOVERY FACILITY
CALARY QUARRY,
KILMACANOGE, CO. WICKLOW

SURFACE WATER MONITORING LOCATIONS

DRAWING I2-1

Scale: 1:2,500 @ A3

Date: JUNE 2016

00180.00109.0.I2-1.SW Monitoring Locations.dwg

ATTACHMENT I2 : SURFACE WATER QUALITY DATA

Surface water samples were previously been taken from the Killough River downstream of the quarry discharge when a quarry was operational at the application site. The results of quality tests on these samples, taken from locations SW2 and SW3 shown on map in Drawing I2-1, are presented in Table I2-1 below. These test results indicate acceptable water quality standards in the Killough River at the time of testing.

Table I2-1

Historical Surface Water Quality Test Results

Parameter	Oct 2000		Feb 2005			Feb 2007				Surface Water Regulations SI 294 of 1989 (A1 waters)
	SW1	SW2	SW1	SW2	SW3	SW1*	SW1#	SW2	SW3	
pH	7.73	8.86	8.15	7.65	7.81					5.5 – 8.5
Electrical Conductivity (µS/cm)	195	147	291	177	180					1000
Hardness (mg/l)	52	19	154	98	46	119	111	69	30	
Phosphorous (mg/l)	0.06	< 0.05	0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	
Chloride (mg/l)	31	4.3	10	13	11	13	14	13	13	250
Nitrate as NO_3 (mg/l)	7.4	8.9	16.2	11.4	10.2	22.0	20.5	15.3	9.3	50
Ammonium** (mg/l)	1.1	0.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
Suspended Solids (mg/l)	10	<10	<10	<10	<10	<10	20	18	<10	
Total Organic Carbon (mg/l)	5	8	<2	<2	<2	4	4	3	4	
BOD (mg/l)	1	<1	<2	<2	<2	<2	<2	<2	<2	5
DROs (µg/l)						29	<10	<10	<10	
Mineral Oil (µg/l)						<10	<10	<10	<10	
PROs C_5-C_9 (µg/l)						<10	<10	<10	<10	
PROs C_{10}-C_{12} (µg/l)						<10	<10	<10	<10	

SW1 Quarry Discharge: * Discharge at settlement tanks
SW2 Sampling point downstream of Calary Quarry discharge: # Discharge at R755 road verge
SW3 Sampling point upstream of Calary Quarry discharge ** Analysed as ammoniacal nitrogen
Feb 2007 analyses performed by ALcontrol Laboratories, Dublin.
DROs - Diesel Range Organics : PROs - Petrol Range Organics
Mineral Oil- A bulk type hydrocarbon (dissolved / emulsified) parameter including petroleum, oil, grease and related materials (measured by gas chromatography)

Water samples were taken from the pond in the former quarry void in May 2014 and tested for quality parameters. Water in the quarry void is understood to predominantly comprise surface water run-off because groundwater ingress is relatively low given the low permeability of local bedrock formations. Additional sampling of water in the quarry void, at the discharge point from the quarry and immediately upstream and downstream of the discharge to the Killough River was undertaken in February 2015. The water quality sampling locations are indicated on Drawing I4-1.

The water samples were noted to be clear, with no visual or olfactory evidence of contamination. The field quality measurements obtained are presented below in Table I2-2 below.

Table I2-2

Surface Water Quality: Field Test Results

Parameter	Quarry Void	Quarry Void	Discharge	SW1	SW2
	May 2014	February 2015			
pH	8.72	6.53	6.73	6.40	6.51
Temperature (ºC)*	10.1	4.22	4.02	3.99	3.98
Conductivity (µS/cm)	176.2	202	178	86	94
DO (mg/l)	3.78	12.7	12.94	13.2	13.24

'* Discharge Limit ≤ 25ºC or ambient

The water sample results and assessment criteria are presented in Table I2-3 overleaf.

Detailed laboratory reports are presented in Chapter 6 of the Environmental Impact Statement (Appendix 6-B).

Table I2-3
Water Quality Test Results

Parameter	Unit	Quarry Void May 2014	Quarry Void Feb 2015	Discharge Feb 2015	SW1 Feb 2015	SW2 Feb 2015	Discharge Licence Limit
pH	pH units	7.72	8.05	8.11	7.50	7.58	6 to 9
BOD5	≤ 5 mg/l O2	<2	<2	<2	<2	<2	≤ 5 mg/l O2
COD	≤ 50 mg/l	9	21	14	17	23	≤ 50 mg/l
Suspended solids	≤ 30 mg/l	2	3	5	11	<2	≤ 30 mg/l
Ammonium	≤ 0.2 mg/l N	0.02	0.02	<0.01	0.03	0.02	≤ 0.2 mg/l N
Chloride	≤ 50 mg/l Cl	<10	<10	<10	11.67	11.99	≤ 50 mg/l Cl
Nitrate	≤ 30 mg/l NO3	<8.9	<8.9	<8.9	<8.9	<8.9	≤ 30 mg/l NO3
Phosphate as P	≤ = 0.03 mg/l MRP	0.025	<0.025	<0.025	<0.025	<0.025	≤ 0.03 mg/l MRP
Diesel Range Organics	≤ 5 mg/l	<0.01	<0.000021	<0.000021	0.000026	0.00019	≤ 5 mg/l
Mineral Oil	≤ 5 mg/l	<0.01	<0.001	<0.001	<0.001	<0.001	≤ 5 mg/l

Roadstone has also undertaken water quality monitoring of the water within the quarry void on a monthly basis since February 2015. A summary of test results is presented in Table I2-4 below. The summary results are from 11 samples, and are compared against Discharge Licence limits.

Table I2-4

Summary of Monthly Water Quality Results 2015-2016

Parameter	Unit	Discharge Licence Limit (WPL87)	Min	Average	Max
Ammonia as NH_4	mg/l	<0.2 (mg/l N)	<0.1	<0.1	<0.1
BOD	mg/l	<5 (mg/l $O_{2)}$	<2	<2	<2
COD	mg/l	<50 (mg/l)	2	5	10
Mineral Oil #	mg/l	<5 (mg/l)	<0.01	0.011	0.04
Nitrate	mg/l	<30 (mg/l)	1	2	3
pH	pH Units	6 to 9	7.9	8	8.7
Molybdate React P	mg/l	<0.03 (mg/l)	0.02	0.03	0.11
Suspended Solids	mg/l	<30 (mg/l)	1	2	3

Copies of monthly monitoring results are provided in Chapter 6 of the Environmental Impact Statement (Appendix 6-C). .