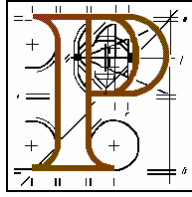


An Bord Pleanála



LOCAL GOVERNMENT (WATER POLLUTION) ACTS 1977 TO 2007

Wicklow County

Register Reference Number WPL 87

An Bord Pleanála Reference Number 27.WW.378

APPEAL by Roadstone Dublin Limited care of SLR Consulting Ireland, 7 Dundrum Business Park, Windy Arbour, Dublin in relation to the granting on the 7th day of October, 2008 by Wicklow County Council, of a licence under section 4 of the Local Government (Water Pollution) Acts 1977 to 2007 to the said Roadstone Dublin Limited for the discharge of treated effluent from a quarry located at Calary, Kilmacanogue, County Wicklow to a tributary of the Killough River.

DECISION: In exercise of the powers conferred on it by section 8 of the Local Government (Water Pollution) Act, 1977, as substituted by section 6 of the Local Government (Water Pollution) (Amendment) Act, 1990, An Bord Pleanála hereby allows the said appeal and directs the licensing authority to attach condition number 6.3 and 10.1 and to remove condition numbers 4.2 and 4.3 and to amend the following condition numbers 2.1, 2.2, 6.1, 6.2, 6.4, 6.7, 8.1 and 8.2 so that they shall be as follows: -

2. Effluent Volume and Characteristics

2.1 The total volume of treated effluent discharged from the settlement tanks shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March). The Licensing Authority reserves the right to modify this condition under licence review, in the interest of environmental protection, in the event that flow monitoring data supplied under Conditions 6.1(a) and 6.1(c) demonstrate that loadings are being discharged from the settlement systems that may adversely affect the receiving environment.

2.2 The treated effluent discharged from the settlement tanks and oil interceptor via the single authorised outfall pipe to the tributary of the Killough River shall comply with the quality standards set out in respect of the parameters in Table 1.

Table 1 Emission Limit Values Discharge Licence WPL87

Parameter	Parametric Limit Value	Units
pH	6 to 9	pH units
Temperature	< / = 25	°C
BOD	< / = 5	mg/l O ₂
COD	< / = 50	mg/l
Suspended Solids	< / = 30	mg/l
Ammonium	< / = 0.2	mg/l N
Chloride	< / = 50	mg/l Cl
Nitrate	< / = 30	mg/l NO ₃
Phosphate as P	< / = 0.03	mg/l MRP
Diesel Range Organics	< / = 5	mg/l
Mineral Oil	< / = 5	mg/l

6. Monitoring Regime

6.1 The Licensee shall

- (a) Install, calibrate and maintain a suitable flow measurement system, recorder and alarm on the effluent flow before discharge to the tributary of the Killough River, and record hourly flow rate and volume discharged on a daily basis. The flow measurement device shall facilitate continuous measurement and the system shall be approved by the licensing authority prior to its adoption as the system to serve the site.
- (b) Install, calibrate and maintain a rain gauge and recorder at suitable location on the premises, record the rainfall on a daily basis.
- (c) Install, calibrate and maintain a pH meter, total suspended solids meter, recorder and alarm on the effluent pipe before discharge to the tributary of the Killough River, and continuously record the pH and concentrations of suspended solids in the effluent.

Certificates of calibration for the flow measurement device, pH meter, total suspended solids meter and rain gauge meter on site, shall be forward to the licensing authority within six months of the date of issue of this licence. Further such certificates shall be submitted on request.

6.2 The units for Diesel Range Organics and Mineral Oil shall be expressed as mg/l to ensure consistency of expression between units in Tables 1 and 2 of the issued discharge licence.

- 6.4 In the event of a result of a test on an effluent sample exceeding a parametric limit value by >20%, additional samples of the effluent and Killough River upstream and downstream of the discharge point shall be taken and tested on a daily basis until such time as the results of the additional samples show that the non-compliance has been brought under control. This additional monitoring of the effluent and Killough River upstream and downstream shall be carried out for the parameter(s) that are determined to exceed, by >20%, parametric limit values specified in Table 1 of this licence.
- 6.7 The licensee shall arrange to have the existing biological survey of the macro-invertebrate population in the Killough River updated at suitable locations upstream and downstream of the quarry discharge once every three years. This survey shall be completed by a competent biologist or ecologist and his/her report on such findings shall be submitted within one month of the survey date.
- 8.1 Legible traceable records of all flow, rainfall and analytical data (with appropriate units shown) referred to in condition number 6 (the monitoring regime) shall be kept on file at the licensee's premises. In addition, a template for the purpose of data recording and evaluation shall be supplied to the licensee by the licensing authority. The licensee shall submit this completed template, in electronic format, with the original electronic copies of the laboratory analytical records for the effluent and receiving environment monitoring and the date for continuous flow, pH and suspended solids measurements, in addition to the rainfall record for the appropriate period. All data shall be submitted within one month of the monitoring period to which it relates. Paper copies of data shall be submitted to the licensing authority within two weeks of a request.
- 8.2 The records referred to in condition numbers 7.2 and 8.1 shall also be made available by the licensee for inspection by authorised persons of the licensing authority, and any other person authorised under section 28 of the Local Government (Water Pollution) Act, 1977.

REASONS AND CONSIDERATIONS

Having regard to the nature and scale of activities on site, the nature of the discharge including its composition presented in baseline sampling, and the characteristics of the receiving waters (which is a tributary of the Killough River which feeds the salmonid River Dargle a short distance downstream) it is considered that the conditions amended and attached are necessary in order to prevent environmental pollution and safeguard the water quality and ecology of the receiving waters.

**Member of An Bord Pleanála
duly authorised to authenticate
the seal of the Board.**

Dated this day of 2009.

Consultant's

Final

REPORT

An Bord Pleanála

Appeal 27.WW0378

Discharge of treated effluent to tributary of Killough River via a single authorised outfall pipe:
Calary Quarry, Kilmacanoge, Co. Wicklow

Local Government (Water Pollution) Acts 1977 & 1990

Consultant Pamela Bartley

September 2009



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Project No.: 09155

Report Title: An Bord Pleanála, Appeal 27.WW0378: Discharge of treated effluent to tributary of Killough River via a single authorised outfall pipe: Calary Quarry, Kilmacanoge, Co. Wicklow

Report Status: FINAL

Date: 15th September 2009

Prepared by:

Dr. Pamela Bartley

NOTES:

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1. Introduction

On the 7th October 2008 Wicklow County Council pursuant to the Local Government (Water Pollution) Acts, 1977 to 2007, granted discharge licence (Wicklow County Council Ref no. WPL87) to Roadstone Dublin Limited to discharge trade effluent from Roadstone Dublin Limited located at Calary Quarry, Kilmacanogue, Co. Wicklow to the nearby tributary of the Killough River via a single outfall pipe after appropriate treatment in quarry floor sumps, settlement tanks and an oil interceptor subject to conditions, which detail 32 specific conditions. This report concerns a 1st party appeal by the Roadstone Dublin Limited against certain conditions of the issued discharge licence. Roadstone Dublin Limited require that conditions 2.1; 2.2; 6.1; 6.2; 6.3; 6.7; 8.1; 8.2 and 10.1 are amended and that conditions 4.2 and 4.3 are deleted.

Table 1 Case Details

Applicant	Roadstone Dublin Limited
Development	Discharge of settled waters from existing quarry (shale, greywacke and quartzite)
Location	Calary, Kilmacanogue, Co. Wicklow (OS Discovery Series 56, 1:50,000)
Discharge Point Grid Reference	322764, 213023 (small tributary of the Killough River)
Licence Application Date	24 th April 2007
Discharge Licence Reference	WPL87
Grant Date	7 th October 2008
Appellant	Roadstone Dublin Limited (Applicant = Appellant, 1 st Party Appeal)
Appeal Date	6 th November 2008
An Bord Pleanala Reference	27.WW0378

2. Discharge Type

The licensed discharge is a discharge of settled waters arising from an existing quarry at Calary Quarry, Kilmacanogue, Co. Wicklow. The discharge waters arise from rainfall runoff from the surfaces of the quarry and a small volume of groundwater ingress from excavated faces. The site is on the lower slopes of the western flank of the Great Sugarloaf Mountain. The quarry has been in operation since 1974. An application for extension (August 2006) prompted a request by Wicklow County Council to formalise the existing discharge.

3. Discharge Licence Issued

A discharge licence was issued by Wicklow County Council (Ref no. WPL87) to Roadstone Dublin Limited to discharge trade effluent from Roadstone Dublin Limited's quarry at Calary Quarry, Kilmacanogue, Co. Wicklow to the nearby tributary of the Killough River via a single outfall pipe after appropriate treatment in quarry floor sumps, settlement tanks and an oil interceptor subject to conditions. The discharge volume that is licensed "shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March)". There are 32 specific conditions attached to this discharge licence, which comprehensively specify the requirements of Wicklow County Council to control the discharge and its potential impact on the receiving environment:

- General Layout and Operation (7 conditions: 1.1 -1.7);
- Effluent Volume and Characteristics (2 conditions 2.1 and 2.2);
- Trade Treatment (1 Condition: 3.1);
- Treatment Plant Maintenance (4 Conditions: 4.1 – 4.4);
- Provision of Monitoring Stations (1 Condition: 5.1);
- Monitoring Regime (7 Conditions: 6.1 – 6.7);
- Sludge and Other Waste Disposal (2 Conditions: 7.1 and 7.2);

- Monitoring Records (2 Conditions: 8.1 and 8.2);
- Access by Authorised Persons (2 Conditions: 9.1 and 9.2);
- Monitoring Contribution to the Licensing Authority (1 Condition: 10.1);
- Notification to the Licensing Authority (3 Conditions: 11.1 – 11.3).

The analysis and assessment conducted by Wicklow County Council of issues associated with the discharge licence is satisfactorily robust. The discharge of settled waters from the quarry will be to the tributary of the Killough River. There are no designated Special Areas of Conservation within the vicinity. However, the discharge will input to a tributary of the Killough River, which itself is a tributary of the Dargle River and the Dargle River is a designated Salmonid Water. The Killough River joins the Dargle River at a distance of 3 km, approximately, downstream of the point of discharge licensed.

4. Appeal Case Details

An Bord Pleanála records a 1st party appeal, dated 6th November 2008, to some of the conditions of this Discharge Licence. In most cases the appellant requests modification of wording of conditions and in some situations requests deletion of conditions. The conditions of Discharge licence WPL87 that are the subject of this appeal, and the main issues raised by the appellant, are summarised as follows:

Condition 2.1: This condition requires that "The treated effluent from the settlement tanks shall be discharged uniformly over a 24 hr period, 7 days a week. The total volume shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March)". The appellant raises the point that it is not reasonable or practical to maintain a uniform discharge over a 24 hr period, 7 days a week. Appellant requests that the requirement for uniform discharge rate is deleted and that this condition retains solely the specification on discharge volume as specified in the Licence "The total volume shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March)".

Condition 2.2: The appellant contends that the Emission Limit Values (ELVs) set for BOD, COD, SS and Nitrate are inconsistent with the recommended ELVs in Section 3.2.2 of the EPA (2006) Environmental Management Guidelines in the Extractive Industry (Non-Scheduled Minerals). Appellant requests revision of ELVs for BOD, COD, SS, Ammonium, Chloride and Nitrate;

Conditions 4.2 and 4.3: These two conditions relate to non-routine maintenance of pumps, settlement tanks and the oil interceptor. Appellant requests that these two conditions are deleted because Roadstone Dublin Limited has their own staff to carry out routine and non-routine inspections and maintenance and operates under a quality assurance program (ISO14001).

Condition 6.1: This condition relates to monitoring the effluent and has 3 parts that deal with the following:

- Installation, calibration and maintenance of a flow measurement flume, recording and alarm warning system;
- Installation of a rainguage at site;
- Installation, calibration and maintenance of a pH and SS meter on the discharge – set up for continuous measurement.

The appellant requests that the specification of 'Flume' is removed from Condition 6.1a and that they are free to choose their own flow measurement device; also that a rainguage is not necessary as there is a rainguage at Enniskerry 4 km away; and that continuous monitoring of pH and SS is not necessary because conditions 6.2 and 6.3 provide for comprehensive water quality sampling and monitoring – they therefore request deletion of part (c) of condition 6.1.

Condition 6.2: Appellant requests that the units specified in Table 2 are revised to be consistent with the parameters and units of Table 1.

Condition 6.3: Appellant requests that the requirement for monitoring the Killough River is revised from four monthly intervals to six monthly intervals.

Condition 6.4: This condition relates to a scenario when the effluent sample exceeds a parametric limit value. Wicklow County Council specified that "In the event of a result of a test on an effluent sample exceeding a parametric limit value, additional samples of the effluent and Killough River upstream and downstream of the discharge point shall be taken and tested on a daily basis until such time as the results of the additional samples show that the non-compliance has been brought under control". The appellant suggests that this is "very onerous" and suggests a re-wording to account for the fact that the additional monitoring shall be for the parameter exceeded only and the frequency of this additional monitoring shall be agreed on a case by case basis with the Local Authority.

Condition 6.7: This condition requires "The Licensee shall arrange to have a biological survey of the macro-invertebrate population in the Killough River and its tributary at suitable locations upstream and downstream of the quarry discharge..... once every two years". The appellant suggests that the tributary is unsuitable (due to its small stream flow) and that the Killough River should be surveyed once in three years rather than one in two years. They therefore require a revision of the wording of this condition.

Condition 8.1: Relating to Monitoring Records. Wicklow County Council required that the laboratory send electronic copies of analytical records directly to Wicklow County Council (the Licensing Authority), in addition to the Licensee keeping records on file at their premises. The appellant suggests that the laboratory cannot send these laboratory results to the licensing Authority – it is not normal practice. Instead, the Licensee (appellant) will send the results in electronic format to Wicklow County Council. In addition, the appellant requests that, subject to their request for deletion of condition 6.1(c), the third sentence of condition 8.1 should be omitted.

Condition 8.2: Appellant suggests that there is a typographical error in this condition wording. The condition specifies that "records referred to in conditions 7.2, 8.1 and 8.2 shall...". The appellant suggests that this condition should only detail "records referred to in conditions 7.2 and 8.1".

Condition 10.1: The discharge licence specifies an annual contribution fee of €898. The appellant suggest that this is excessive and requests a revision of the annual contribution amount to €450 and requests that the Board revise this condition to provide for this reduced level of contribution.

Wicklow County Council (in a letter dated 25th February 2009) responded to the first party appeal and made observations and submissions in respect of the appeal. This response provided the Waste Assimilative Capacity assimilation simulations that were completed by Wicklow County Council in order to assess the ability of the stream to accept the discharge. Monitoring data for the River are also presented. Wicklow County Council makes the case that the conditions are based on a scientific assessment of the receiving environment's ability to accept the discharge and that limits and conditions are based upon that. However, Wicklow County Council agrees to some of the changes proposed by the appellant. I will refer to these in the Section 7 of this report "Recommendations on conditions under Appeal".

5. The Activity & Receiving Environment

5.1. Hydrology

This discharge comes from an environment where the rocks are tightly bedded, faulted and compressed and so there is only a small potential for groundwater inflow. Consequently, there is a higher potential for runoff in this catchment of relatively hard rock and mountainous topography. The quarry has been operating and discharging stormwaters since 1974. This is a mountainous catchment with flashy high peak flows that respond rapidly to rainfall. There are low flows in the rivers between rainfall events. The activity at the site and the volumes of water being managed for discharge have been described on behalf of the applicant in a report entitled 'Report to accompany an application for a Trade Effluent Discharge Licence at Calary Quarry Kilnacanoge County Wicklow' (report dated 23/04/07). This report presents some information on the estimated volumes of stormwater and groundwater that will require management at the quarry and existing management system: there is a small amount of groundwater ingress and a small sump and settlement tank system in place. Monitoring data for the discharge is presented and evaluated for a record spanning the years 2000 to 2007. Three monitoring events on the stream are presented and evaluated. The volumetric amount requiring discharge is calculated by the applicant's agent to range from 800 to 2000 m³/d, approximately. No assimilation capacity simulation is presented by the applicant. However, Wicklow County Council conducted a waste assimilative capacity on the stream in order to process the discharge licence. Wicklow County Council assess that the receiving water has the following characteristics:

- Catchment Area = 2.2 km²
- Estimated Wintertime average flow = 0.075 m³/s
- Estimated Low Flow = 0.003 m³/s

Based upon the above characteristics, Wicklow County Council have determined that the receiving water has the ability to receive a discharge volume that "shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March)" for a range of Parametric Limit Values (Emission Limit Values) as specified in Condition 2.2, Table 1, which is reproduced as follows:

Table 1 Treated Effluent Discharge Concentrations: Condition 2.2 of Calary Quarry Discharge Licence WPL87

Parameter	Parametric Limit Value	Units
pH	6 to 9	pH units
Temperature	< / = 25	oC
BOD	< / = 5	mg/l O ₂
COD	< / = 50	mg/l
Suspended Solids	< / = 30	mg/l
Ammonium-N	< / = 0.05	mg/l N
Chloride	< / = 15	mg/l Cl
Nitrate as N (NO ₃ -N)	< / = 5.7	mg/l
Phosphate as P	< / = 0.03	mg/l MRP-P
Diesel Range Organics	< / = 5	mg/l
Mineral Oil	< / = 5	mg/l

Wicklow County Council licensed this discharge on the basis of Waste Assimilative Capacity Simulations that they completed and long term water quality monitoring for the receiving environment.

6. Interpretation of the Case

6.1. Site Visit & Field Based Assessment

On the 14th July 2009 I visited the Kilmacanogue area and the Roadstone Dublin Limited's quarry at Calary Quarry, Kilmacanogue, Co. Wicklow. General catchment characteristics and pressures were noted in association with the nature of the receiving water. I was shown around the site by the quarry manager. We inspected the point of discharge, the quarry extraction area, the quarry sump, the settlement tanks and pump systems. The quarry manager also showed me the soil importing and banking system that they are licensed for. Imported soil is used in quarry landscape restoration.

6.2. Analysis of Site & Case File Data

6.2.1. Hydrology, Water Quality & Catchment Characteristics

Wicklow County Council has appropriately defined the hydrology, hydrochemistry and catchment characteristics for the receiving environment. It is unclear how Wicklow County Council determined the value for 'Estimated Wintertime average flow = 0.075 m³/s'. On a national scale, based on my experience of flow rate volumes for similar catchment geology, an average river flow volume of 0.075 m³/s for a 2.2 km² catchment might seem to slightly over-estimate flows but the mountainous nature of this catchment and flashy hydrology might substantiate it as representative for this location. Therefore, I think it's a valid estimation of wintertime flow for this particular location/assessment. The estimated low flow value of 0.003 m³/s seems reasonable enough based on the catchment characteristics and data from other hydrological stations.

6.2.2. Assimilation Capacity Assessment & Results of Simulations

I conducted independent assimilation capacity and dilution factor assessments for the average daily discharge volume proposed and the maximum daily discharge volume permitted by the Discharge Licence (WPL87). Simulations were for both average and maximum proposed discharge volumes and for average river flow and low river flow conditions. In each simulation run I considered 3 distinct concentration values in the discharge waters as the parameters of the discharge concentrations in the settled effluent (storm and groundwater) discharged from Calary Quarry to the Killough River. The different concentration values related to the following:

- The Parametric Limit Values stipulated in the discharge licence (WPL87) Table 1;
- EPA (2006) Environmental Management Guidelines in the Extractive Industry (Non-Scheduled Minerals) Guideline Emission Limit Values; or
- Other Emission Limit Values as requested by the appellant.
- Results of my assimilation capacity simulations are presented in Appendix A.

Appendix A1 Assimilation Capacity Simulation Results: In the first case, I conducted the assimilation capacity simulations using the average flow rate from the discharge system that is flowing into an average flow rate in the river. Assimilation capacity simulations suggest that for the Discharge Licence's Emission Limit Values, the river's resultant simulated concentrations conform to the requirements of the Local Government (Water Pollution) Act 1977, (Water Quality Standards for Phosphorous) Regulations 1998 (S.I 258 of 1998) and European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. 293/1988).

Appendix A2 Assimilation Capacity Simulation Results: In a second round of simulations I employed the maximum daily discharge volume permitted by the Discharge Licence (WPL87) that is flowing into an average flow rate in the river. Assimilation capacity simulations suggest that for the Discharge Licence's Emission Limit Values, the river's resultant simulated concentrations conform to the requirements of the Local Government (Water Pollution) Act

1977, (Water Quality Standards for Phosphorous) Regulations 1998 (S.I 258 of 1998) and European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. 293/1988).

Appendix A3 Assimilation Capacity Simulation Results: In a third round of simulations I employed the average daily discharge volume permitted by the Discharge Licence (WPL87) that is flowing into a low flow rate in the river. Assimilation capacity simulations suggest that for the Discharge Licence's Emission Limit Values, the river's resultant simulated concentrations conform to the requirements of the Local Government (Water Pollution) Act 1977, (Water Quality Standards for Phosphorous) Regulations 1998 (S.I 258 of 1998) and European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. 293/1988).

Simulation results have been used in my judgements to either support the existing Conditions of Discharge Licence WPL87 or make amendments to the conditions under appeal. The appellant contends that the Emission Limit Values (ELVs) set for BOD, COD, SS and Nitrate are inconsistent with the recommended ELVs in Section 3.2.2 of the EPA (2006) Environmental Management Guidelines in the Extractive Industry (Non-Scheduled Minerals). The appellant requests revision of ELVs for BOD, COD, SS, Ammonium, Chloride and Nitrate. With respect of each of these parameters, the assimilation capacity simulation results that I have completed suggest the following:

BOD: The Emission Limit Value for BOD was set at 5 mg/l BOD because under low flow conditions in the river this is the value that appears sustainable. For the specified 5 mg/l BOD limit, simulations suggest that BOD concentration in the river will remain within the 5 mg/l requirement of the Salmonid Regulations (SI 293/1988) for average and low flow conditions in the receiving waters. The GUIDELINE VALUE specified by EPA (2006) is not appropriate to this receiving water's flow characteristic because simulations suggest that the Salmonid Regulations (SI 293/1988) would be breached for an average quarry flow volume discharging to the receiving water when the receiving water is experiencing low flows (refer to Appendix A3);

COD: It was not possible to simulate for the requested change in the COD Parametric Limit Value because no monitoring data was provided for COD concentration. Therefore, no assessment of potential impact could be assessed. If the appellant requests a change, they should at least provide the data and scientific analysis to support the requested change. In the absence of data supplied by the appellant to support their case, I assume that if we have previously determined that the stream flow in the low flow condition is unsuitable to support a revision of the Biochemical Oxygen Demand (BOD) limit then the river may not be able to support a revised Chemical Oxygen Demand limit (COD);

SS: The Emission Limit Value for Suspended Solids was set at 30 mg/l SS because under low flow conditions in the river, this is the value that appears sustainable (refer to Appendix A3).

Ammonium: The Emission Limit Value for Ammonium was set at 0.05 mg/l Ammonium N because under all flow conditions in the river, this is the value that appears sustainable (refer to Appendices A1, A2 and A3). Ammonium is toxic to aquatic life. This parameter is of special interest in the downstream receiving environment;

Chloride: The appellants request to revise the parametric limit value for chloride from 15 mg/l Cl (as specified in Table 1 of the Discharge Licence) to 250 mg/l Cl (as specified as an indicator parameter in the Drinking Water (no.2) Regulations 2007) is unrealistic. Existing Chloride concentration in the receiving water is 12 mg/l, approximately. Wicklow County Council appear to have selected the 15 mg/l Cl parametric limit value because there will be little change in the receiving waters resultant chloride concentration for the post discharge condition under many flow scenarios. However, if we were to adopt the limit value requested by the appellant, the resultant chloride concentrations in the receiving waters could rise to 40 – 70 mg/l Cl for average and maximum quarry discharge volumes discharging to the stream under average stream flow conditions, respectively (refer to Appendix A1 & A2). However, of graver concern is the simulated output for the low flow condition: results (presented in Appendix A3) suggest that the resultant chloride concentrations

in the receiving waters could rise to 198 mg/l Cl for the post discharge condition when average flow volumes discharging from the quarry's settlement system were inputted to the Killough River;

Nitrate: Results of simulations suggest that the Emission Limit Value for nitrate-N was set at 5.7 mg/l NO₃-N because under the low flow condition in the river, that is the value that permits the river to remain within targets specified by water quality legislation (SI 101 of 2009), especially under the low flow condition (Appendix A3).

The overall conclusion is that Wicklow County Council has appropriately set the Emission Limit Values, as specified in Table 1 of Discharge Licence WPL87, cognisant of the ability of the receiving water to assimilate the discharge under a variety of flow discharge volume and receiving water flow condition scenarios.

7. Recommendations on Conditions Under Appeal

The conditions of Discharge licence WPL87 that are the subject of this appeal and the main issues raised by the appellant were summarised in Section 4. My conclusion on each condition under appeal is based on information supplied by the appellant, the response of Wicklow County Council to the case made in the appeal (Wicklow County Council responded to the appeal in a letter dated 25th February 2009 that details the opinion of the Local Authority on each condition under appeal and provides the rationale behind conditions of the licence), the information gathered during my site visit and catchment assessment and the assimilation capacity simulation results that I independently conducted for the receiving water under all the scenarios detailed in Section 6 and Appendix A:

Condition 2.1: It is recommended that the appeal be allowed in respect of Condition 2.1 of Discharge Licence WPL87. Having regard to the information contained in the documentation submitted with the application and appeal it is recommended that the discharge volumes permitted should remain the same as that which is specified in the issued discharge licence but that the requirement to discharge uniformly over a 24-hour period, 7 days a week is impracticable because if there is no rainfall then there will be no discharge to dispose of. Therefore, it is not possible to guarantee a discharge for every day of the week. The discharge is controlled by pumps in the sump that are activated in response to rainfall events (groundwater inflow to this quarry is relatively small most of the time). Therefore, the discharge will respond in harmony with hydrological activity in the catchment. Periods of high rainfall and consequent induced river flow will be matched with a higher output of discharge from the quarry. Wicklow County Council has stipulated elsewhere in the Licence that a continuous flow meter and a rain gauge are installed at the site. Analysis of these data will facilitate modification of the discharge regime if problems are observed: the applicant/appellant can employ monitoring data to modify their own settlement system in order to solve problems and ensure compliance with environmental quality objectives without instruction from the local authority. In the event that the settlement system is found to be discharging shock loadings or large pulses, I am recommending that a qualification is added to the Condition 2.1. It is recommended that Condition no. 2.1 of Discharge Licence WPL87 be revised as follows:

WPL87 Condition 2.1 REVISED "The total volume of treated effluent discharged from the settlement tanks shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March). Wicklow County Council reserves the right to modify this condition under licence review, in the interest of environmental protection, in the event that flow monitoring data supplied under Conditions 6.1(a) and 6.1(c) demonstrate that loadings are being discharged from the settlement systems that may adversely affect the receiving environment".

Condition 2.2: It is recommended that the appeal be refused in respect of Condition 2.2 of Discharge Licence WPL87. The appellant contends that the Emission Limit Values (ELVs) set for BOD, COD, SS and Nitrate are inconsistent with the recommended ELVs in Section 3.2.2 of the EPA (2006) Environmental Management Guidelines in the Extractive Industry (Non-Scheduled Minerals). Appellant requests revision of ELVs for BOD, COD, SS, Ammonium, Chloride and Nitrate. Having regard to the information contained in the documentation submitted with the application

and appeal it is considered that that Wicklow County Council set the ELVs for BOD, COD, SS, Ammonium, Chloride and Nitrate that are appropriate to the scale of the stream into which the discharge is proposed. I have also assessed the assimilative capacity of the receiving water and validated Wicklow County Councils assessment of potential impact with respect to the parameters.

Conditions 4.2 and 4.3: It is recommended that the appeal be allowed in respect of Conditions 4.2 & 4.3 of Discharge Licence WPL87. These two conditions relate to non-routine maintenance of pumps, settlement tanks and the oil interceptor. Appellant requests that these two conditions are deleted because Roadstone Dublin Limited has their own staff to carry out routine and non-routine inspections and maintenance and operates under a quality assurance program (ISO14001). Having regard to the operation of the ISO quality assurance program and the robust conditions of this discharge licence (constant flow monitoring, rain gauge, water quality monitoring, biological surveys and daily monitoring of problematic parameters if detected in the discharge) it is considered that it is in the best interest of the appellant to ensure that their pumps, and settlement systems, are operating correctly. Therefore, if the appellant requires external contractors to assist in compliance, it is in their interest to secure their services and it is not necessary to condition the licence as so in the interest of not imposing excessive operating costs on the business. In conclusion, it is recommended that Conditions 4.2 & 4.3 of Discharge Licence WPL87 are deleted.

Condition 6.1: It is recommended that the appeal be allowed in respect of Condition 6.1 (a) & Condition 6.2 (b) of Discharge Licence WPL87 but it is recommended that the appeal be refused in respect of Condition 6.1(c). The appellant requests rewording of Condition 6.1 (a) and Condition 6.1 (b) and deletion of Condition 6.1 (c). Wicklow County Council do not object to the rewording of Condition 6.1 (a) and Condition 6.1 (b) but suggest that Condition 6.1 (c) is necessary. Condition 6.1 (a) & Condition 6.2 (b) are to be re-worded as follows:

The general requirement of Condition 6.1 regarding certificates of calibration, as originally specified in WPL87 Discharge Licence, shall be re-worded as follows: "Certificates of calibration for the flow measurement device, pH meter and total suspended solids meter shall be forwarded to the Licensing Authority within six months of the date of issue of this Licence. Further such certificates shall be submitted on request."

WPL87 Condition 6.1 (a) REVISED Install, calibrate and maintain a suitable flow measurement system, recorder and alarm on the effluent pipe before discharge to the tributary of the Killough River and record hourly flowrate and volume discharged on a daily basis. The flow measurement device must facilitate continuous measurement and the system must be approved by the Licensing Authority prior to its adoption as the system to serve the site.

WPL87 Condition 6.1 (b) REVISED Record Rainfall on a daily basis from a nearby raingauge or from a rain gauge provided at a suitable location on the site.

Condition 6.1(c) remains and is worded as specified in the discharge licence (WPL87).

Condition 6.2: It is recommended that the appeal be allowed in respect of Condition 6.2. Appellant requests that the units specified in Table 2 are revised to be consistent with the parameters and units of Table 1. The units for Diesel Range Organics and Mineral Oil should be expressed as mg/l to ensure consistency of expression of units in Tables 1 & 2.

Condition 6.3: It is recommended that the appeal be refused in respect of Condition 6.3 of Discharge Licence WPL87. The specified requirement for monitoring the Killough River at four monthly intervals is more appropriate to the environment than the requested six monthly intervals outlined in the appeal case.

Condition 6.4: It is recommended that the appeal be allowed in respect of Condition 6.4 and that this condition is re-worded. This condition relates to a scenario when the effluent sample exceeds a parametric limit value. Wicklow County Council specified that "In the event of a result of a test on an effluent sample exceeding a parametric limit value, additional samples of the effluent and Killough River upstream and downstream of the discharge point shall be taken and tested on a daily basis until such time as the results of the additional samples show that the non-compliance has been brought under control". The appellant suggests that this is "very onerous" and suggests a re-wording to account for the fact that the additional monitoring shall be for the parameter exceeded only, that only the effluent and not the receiving water should be tested and that the frequency of this additional monitoring shall be agreed on a case by case basis with the Local Authority. Wicklow County Council suggests that the additional monitoring be carried out when the exceedence is >20%. I agree with both the appellant and the Licensing Authority, the additional monitoring should be for the problematic parameter only and carried out in the case of a significant exceedence only. I suggest that the effluent and the receiving water should be tested daily in the case of the >20% exceedence. The appellant is in control of the settlement system: correct operation of the settlement system will negate the actuality of this condition in practical terms. Therefore, Condition 6.4 should be re-worded as follows:

WPL87 Condition 6.4 REVISED: "In the event of a result of a test on an effluent sample exceeding a parametric limit value by >20%, additional samples of the effluent and Killough River upstream and downstream of the discharge point shall be taken and tested on a daily basis until such time as the results of the additional samples show that the non-compliance has been brought under control. This additional monitoring of the effluent and Killough River upstream and downstream will be carried out for the parameter(s) that are determined to exceed, by >20%, parametric limit values specified in Table 1 of this licence".

Condition 6.7: It is recommended that the appeal be allowed in respect of Condition 6.7 and that this condition is re-worded. The appellant suggests that the tributary is an unsuitable location for biological assessment, due to its small stream flow, and that the Killough River should be surveyed one in three years rather than one in two years. They therefore require a revision of the wording of this condition. Wicklow County Council does not object to the requested change. Therefore, Condition 6.7 should be re-worded as follows:

WPL87 Condition 6.7 REVISED: "The Licensee shall arrange to have the existing biological survey of the macro-invertebrate population in the Killough River updated at suitable locations upstream and downstream of the quarry discharge once every three years. This survey must be completed by a competent biologist or ecologist and their report on their findings shall be submitted within one month of the survey date".

Condition 8.1: It is recommended that the appeal be allowed in respect of some requirements of Condition 6.4 and therefore requires re-wording but not to the extent requested by the appellant. This condition related to Monitoring Records. Wicklow County Council required that the laboratory send electronic copies of analytical records directly to Wicklow County Council (the Licensing Authority), in addition to the Licensee keeping records on file at their premises. The appellant suggests that the laboratory cannot be instructed to send these laboratory results directly to the licensing Authority – it is not normal practice. Instead, the Licensee (appellant) will send the results in electronic format to Wicklow County Council. In addition, the appellant requests that, subject to their request for deletion of Condition 6.1(c), the third sentence of condition 8.1 should be omitted; However, I have recommended that the appellants appeal be refused in respect of deletion of Condition 6.1(c).

WPL87 Condition 8.1 REVISED: "Legible traceable records of all flow, rainfall and analytical data (with appropriate units shown) referred to in Condition 6 (the monitoring regime) shall be kept on file at the premises. In addition, a template for the purpose of data recording and evaluation will be supplied to the Licensee by the Licensing Authority. The Licensee shall submit this completed template, in electronic format, with the original electronic copies of the laboratory analytical records for the effluent and receiving environment monitoring and the data for continuous flow, pH and Suspended solids measurements, in addition with the rainfall record for the appropriate period. All data must be submitted within one month of the monitoring period to which they relate. Paper copies of data shall be submitted to the Licensing Authority upon two weeks of a request."

Condition 8.2: It is recommended that the appeal be allowed in respect of Condition 8.2 and therefore requires re-wording. Wicklow County Council acknowledges the original typographical error in this condition's wording.

WPL87 Condition 8.2 REVISED: "The records referred to in conditions 7.2 and 8.1 shall also be made available by the Licensee for inspection by Authorised Officers of the Licensing Authority, and any other person authorised under Section 28 of the Local Government (Water Pollution) Act, 1977, or under Section 14 of the Waste Management Act, 1996 at any time on request".

Condition 10.1: It is recommended that the appeal be refused in respect of Condition 10.1. The discharge licence specifies an annual contribution fee of €898. The appellant suggest that this is excessive and requests a revision of the annual contribution amount to €450 and requests that the Board revise this condition to provide for this reduced level of contribution. It is considered that the fees have been set according to the costs likely to be incurred by the Licensing Authority.

8. Conclusions

8.1 The overall conclusion is that Wicklow County Council has appropriately set the Emission Limit Values, as specified in Table 1 of Discharge Licence WPL87, cognisant of the ability of the receiving water to assimilate the discharge under a variety of flow discharge volume and receiving water flow condition scenarios.

8.2 In some cases, it is appropriate for the wording of some of the conditions under appeal to be changed and in other cases it is not appropriate to sanction changes, as requested by the appellant.

8.3 I recommend that the Board allow the appeal and direct the planning authority to grant a revised discharge licence to the applicant in accordance with the terms of the Manager's Order dated 7th October 2008 subject to the following amendments for the conditions listed here:

- Allow the appeal and amend wording of Conditions 2.1, 6.1a, 6.1b, 6.2, 6.4, 6.7, 8.1 and 8.2;
- Allow the appeal and delete Conditions 4.2 and 4.3.

8.4 I recommend that the Board refuse the appeal and direct the planning authority to grant a revised discharge licence to the applicant in accordance with the terms of the Manager's Order dated 7th October 2008 subject to the following amendments for the conditions listed here:

- Refuse the appeal and retain, as originally specified, Conditions 2.2, 6.1c, 6.3 and 10.1.

9. Decision of Inspector

In exercise of the powers conferred on it by Section 8 of the Local Government (Water Pollution) Act 1977, as substituted by section 6 of the Local Government Act (Water Pollution) (Amendment) Act, 1990, this inspector recommends to An Bord Pleanála to allow the said appeal and amend wording in respect of Conditions 2.1, 6.1a, 6.1b, 6.2, 6.4, 6.7, 8.1 and 8.2 so that they shall be as follows, allow the said appeal and delete Conditions 4.2 and 4.3 and refuse the said appeal in respect of Conditions 2.2, 6.1c, 6.3 and 10.1 so that they are retained as specified in Discharge Licence WPL87 as follows:

Condition 2.1 The total volume of treated effluent discharged from the settlement tanks shall not normally exceed 805 m³/d subject to a maximum volume of 1600 m³/d during summertime (April to September) or 2000 m³/d during wintertime (October to March). Wicklow County Council reserves the right to modify this condition under licence review, in the interest of

environmental protection, in the event that flow monitoring data supplied under Conditions 6.1(a) and 6.1(c) demonstrate that loadings are being discharged from the settlement systems that may adversely affect the receiving environment.

Condition 4.2 *to be deleted*

Condition 4.3 *to be deleted*

Condition 6.1 The Licensee shall:

- 6.1a Install, calibrate and maintain a suitable flow measurement system, recorder and alarm on the effluent pipe before discharge to the tributary of the Killough River, and record hourly flowrate and volume discharged on a daily basis. The flow measurement device must facilitate continuous measurement and the system must be approved by the Licensing Authority prior to its adoption as the system to serve the site.
- 6.1b Record Rainfall on a daily basis from a nearby raingauge or from a rain gauge provided at a suitable location on the site.
- 6.1c Install, calibrate and maintain a pH meter, total suspended solids meter, recorder and alarm on the effluent pipe before discharge to the tributary of the Killough River, and continuously record the pH and concentrations of suspended solids in the effluent.

Certificates of calibration for the flow measurement device, pH meter and total suspended solids meter shall be forwarded to the Licensing Authority within six months of the date of issue of this Licence. Further such certificates shall be submitted on request.

Condition 6.4 In the event of a result of a test on an effluent sample exceeding a parametric limit value by >20%, additional samples of the effluent and Killough River upstream and downstream of the discharge point shall be taken and tested on a daily basis until such time as the results of the additional samples show that the non-compliance has been brought under control. This additional monitoring of the effluent and Killough River upstream and downstream will be carried out for the parameter(s) that are determined to exceed, by >20%, parametric limit values specified in Table 1 of this licence

Condition 6.7 The Licensee shall arrange to have the existing biological survey of the macro-invertebrate population in the Killough River updated at suitable locations upstream and downstream of the quarry discharge once every three years. This survey must be completed by a competent biologist or ecologist and their report on their findings shall be submitted within one month of the survey date.

Condition 8.1 Legible traceable records of all flow, rainfall and analytical data (with appropriate units shown) referred to in Condition 6 (the monitoring regime) shall be kept on file at the premises. In addition, a template for the purpose of data recording and evaluation will be supplied to the Licensee by the Licensing Authority. The Licensee shall submit this completed template, in electronic format, with the original electronic copies of the laboratory analytical records for the effluent and receiving environment monitoring and the data for continuous flow, pH and Suspended solids measurements, in addition with the rainfall record for the appropriate period. All data must be submitted within one month of the monitoring period to which they relate. Paper copies of data shall be submitted to the Licensing Authority upon two weeks of a request.

Condition 8.2 The records referred to in conditions 7.2 and 8.1 shall also be made available by the Licensee for inspection by Authorised Officers of the Licensing Authority, and any other person authorised under Section 28 of the Local Government (Water Pollution) Act, 1977, or under Section 14 of the Waste Management Act, 1996 at any time on request.

Refuse the said appeal in respect of Conditions 2.2, 6.1c, 6.3 and 10.1 so that they are retained as specified in Discharge Licence WPL87 as follows:

Condition 2.2 The treated effluent discharged from the settlement tanks and oil interceptor via the single authorised outfall pipe to the tributary of the Killough River Shall comply with the quality standards set out in respect of the parameters in Table 1.

Table 1 Emission Limit Values Discharge Licence WPL87

Parameter	Parametric Limit Value	Units
pH	6 to 9	pH units
Temperature	< / = 25	oC
BOD	< / = 5	mg/l O ₂
COD	< / = 50	mg/l
Suspended Solids	< / = 30	mg/l
Ammonium-N	< / = 0.05	mg/l N
Chloride	< / = 15	mg/l Cl
Nitrate as N (NO ₃ -N)	< / = 5.7	mg/l
Phosphate as P	< / = 0.03	mg/l MRP-P
Diesel Range Organics	< / = 5	mg/l
Mineral Oil	< / = 5	mg/l

Condition 6.1c Install, calibrate and maintain a pH meter, total suspended solids meter, recorder and alarm on the effluent pipe before discharge to the tributary of the Killough River, and continuously record the pH and concentrations of suspended solids in the effluent.

Condition 6.3 The Licensee shall arrange to have samples taken from the tributary of the tributary of the Killough River upstream and downstream of the confluence with the stream carrying the quarry discharge and also from the stream carrying the quarry discharge once every four months in respect of the parameters listed in Table 3.

Table 3

Parameter	Unit of Expression
pH	pH unit
Temperature	oC
BOD ₅	mg/l O ₂
Suspended Solids	mg/l
Orthophosphate	mg/l P
Nitrate	mg/l N
Chloride	mg/l Cl
Dissolved Oxygen	mg/l O ₂
Turbidity	NTU

Condition 10.1 The Licensee shall pay on demand an annual contribution fee of €898 towards the Licensing Authority's (Wicklow County Council) monitoring costs. The first such payment shall be calculated pro-rata from the date of issue of the Licence to the end of the calendar year *i.e.*

€211.58. The subsequent annual contribution fees shall be reckoned on the initial sum of €898 when adjusted in accordance with the consumer price index for the intervening period since the date of issue of the Licence.

Pamela Bartley

Signed: _____

Dr. Pamela Bartley

Date: 15th September 2009

REFERENCES

Directive 78/659/EEC (Quality of Freshwaters needing protection or improvement in order to support fish life) 18th July 1978.

Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000.

Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of freshwaters needing protection or improvement in order to support fish life.

Environmental Research Unit (1992) Parameters of Water Quality. Interpretation and Standards

EPA (2006) Environmental Management Guidelines. Environmental Management in the Extractive Industry (Non-Scheduled Minerals)

European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. 293/1988)

European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. 294/1989)

European Communities (Drinking Water) (No. 2) Regulations, 2007 (S.I. 278/2007)

EUROPEAN COMMUNITIES (GOOD AGRICULTURAL PRACTICE FOR PROTECTION OF WATERS) REGULATIONS 2009 (S.I. No. 101 of 2009)

Local Government (Water Pollution) Acts 1977 and 1990

Local Government (Water Quality Standards for Phosphorous) Regulations, 1998 (S.I 258 of 1998)

Appendix A Assimilation Capacity Simulations (Pamela Bartley)

Appendix A1: Average Discharge from Quarry (as per Discharge Licence issued) flowing into Average Flow Stream (Wicklow County Council Flow data)

Development Roadstone Ireland Limited, Calary Quarry, Kilmacanogue, Co. Wicklow
Catchment Housing Density Mountainous, very sparse residences
Receiving Water Stream Tributary of Killough River
Downstream Receptors Dargle River (Salmonid, 3km downstream)

FLOW RELATIONSHIPS
 m3/s Q Discharge (805 m3/d)
 m3/s Q Stream
 Average Flow ratio Q Discharge : Q Stream = 0.009 AVERAGE
 0.075 (WCC Estimate Average)
 8

m3/s Q MAX Discharge (2000 m3/d)
 m3/s Q Stream
 Average Flow ratio Q Discharge : Q Stream = 0.023 MAX Discharge Licence
 0.075 (WCC Estimate Average)
 3

		MRP (as P)		Discharge Licence Limit		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	0.0128	mg/l		
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.01	mg/l		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	0.03	mg/l		

		Ammonia NH3-N		Discharge Licence Limit		APPELLANTS REQUESTED ELV		APPELLANTS REQUESTED ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	0.01	mg/l		0.04		
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.01	mg/l		0.01		four fold increase not acceptable for ammonia
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	0.03	mg/l		0.3		

		SS		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	7.7628	mg/l		8.3150		within limits for average Quarry Discharge and Average River Flow
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	5	mg/l		5		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	30.99	mg/l		35.00		

		BOD		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	1.7088	mg/l		3.9189		within limits for average Quarry Discharge and Average River Flow BUT three fold increase
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	1.3	mg/l		1.3		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		25		

		COD		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		mg/l				
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	no monitoring data supplied by applicant, appellant or Wicklow County Council					
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		no data to support changing
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	50.00	mg/l		100		

		Chloride		Discharge Licence Limit		APPELLANTS REQUESTED ELV		APPELLANTS REQUESTED ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	12.3318	mg/l		38.2992		not acceptable
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	12	mg/l		12		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	15.00	mg/l		250		

		NO3-N		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	2.8536	mg/l		3.4724		within limits for average Quarry Discharge and Average River Flow, little difference in response to ELV of 5.7 or 11.3
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	2.5	mg/l		2.5		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.70	mg/l		11.3		

		DRO		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	0.6528	mg/l		0.1108		FOR TOTAL HYDROCARBONS
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.00001	mg/l		0.00001		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		1		

		Mineral Oil		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
F = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T	0.6528	mg/l		0.1108		FOR TOTAL HYDROCARBONS
F = upstream receiving river flow, Average flow (m3/s)		F	F	0.075	m3/s		0.075		
Q (m3/d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.00001	mg/l		0.00001		
Q (m3/s)	0.00931713	f = DISCHARGE flow discharging to receiving waters (m3/s)	f	0.00931713	m3/s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		1		

Appendix A2: Maximum Discharge from Quarry (as per Discharge Licence issued) flowing into Average Flow Stream (Wicklow County Council Flow data)

Development
Catchment Housing Density
Receiving Water
Downstream Receptors

Roadstone Ireland Limited, Calary Quarry, Kilmacanogue, Co. Wicklow
Mountainous, very sparse residences
Stream Tributary of Killough River
Dargle River (Salmonid, 3km downstream)

FLOW RELATIONSHIPS
m³/s Q Discharge (805 m³/d)
m³/s Q Stream
Average Flow ratio :Q Discharge

0.023 AVERAGE
0.075 (WCC Estimate Average)
3

m³/s Q MAX Discharge (2000 m³/d)
m³/s Q Stream
Average Flow ratio :Q Discharge

0.023 MAX Discharge Licence
0.075 (WCC Estimate Average)
3

		MRP (as P)				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		0.0147	mg/l			
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s			
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		0.01	mg/l			
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s			
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		0.03	mg/l			
		Ammonia NH3-N				Discharge Licence Limit		APPELLANTS REQUESTED ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		0.02	mg/l		0.03	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		0.01	mg/l		0.01	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		0.05	mg/l		0.3	
		SS				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		10.8962	mg/l		12.0758	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		5	mg/l		5	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		30.00	mg/l		35.00	
		BOD				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		2.1726	mg/l		6.8896	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		1.3	mg/l		1.3	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		5.00	mg/l		25	
		COD				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T			mg/l			
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		0.023148148	m ³ /s		0.023148148	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (mg/l)	I		50.00	mg/l		100	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c						
		Chloride				Discharge Licence Limit		APPELLANTS REQUESTED ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		12.7075	mg/l		68.1321	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		12	mg/l		12	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		15.00	mg/l		250	
		NO3-N				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		3.2547	mg/l		4.0758	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		2.5	mg/l		2.5	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		5.70	mg/l		11.3	
		DRO				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		1.1793	mg/l		0.2359	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		0.00001	mg/l		0.00001	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		5.00	mg/l		1	
		Mineral Oil				Discharge Licence Limit		EPA 2006 Suggested ELV	
Y = (FC+fc)/(F+f)		T = RESULTANT concentration in the receiving water (mg/l)	T		1.1793	mg/l		0.2359	
F = upstream receiving river flow, Average flow (m ³ /s)		F	F		0.075	m ³ /s		0.075	
Q (m ³ /d)	2000	C = background/upstream concentration in receiving water (mg/l)	C		0.00001	mg/l		0.00001	
Q (m ³ /s)	0.023148148	I = DISCHARGE flow discharging to receiving waters (m ³ /s)	I		0.023148148	m ³ /s		0.023148148	
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c		5.00	mg/l		1	

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Appendix A3: Average Discharge from Quarry (as per Discharge Licence issued) flowing into Low Flow Stream (Wicklow County Council Flow data).

Development
Catchment Housing Density
Receiving Water
Downstream Receptors

Roadstone Ireland Limited, Calary Quarry, Kilmacanogue, Co. Wicklow
Mountainous, very sparse residences
Stream Tributary of Killough River
Dargle River (Salmonid, 3km downstream)

FLOW RELATIONSHIPS
m³/s Q Discharge (805 m³/d)
m³/s Q LOW FLOW Stream
Average Flow ratio :Q Discharge

0.009 AVERAGE
0.003 (WCC Estimate LOW Flow)
0.32

m³/s Q MAX Discharge (2000 m³/d)
m³/s Q LOW FLOW Stream
Average Flow ratio :Q Discharge

0.023 MAX Discharge Licence
0.003 (WCC Estimate LOW Flow)
0.13

		MRP (as P)		Discharge Licence Limit		EPA 2006 Suggested ELV	
T = (FC+fc)/(F+f)		T					
T = RESULTANT concentration in the receiving water (mg/l)				0.0251	mg/l		
F = upstream receiving river flow, LOW flow (m ³ /s)		F		0.003	m ³ /s		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.01	mg/l		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	0.03	mg/l		

		Ammonia NH3-N		Discharge Licence Limit		APPELLANTS REQUESTED ELV		APPELLANTS REQUESTED ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				0.04	mg/l		0.23		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.01	mg/l		0.01		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		20 fold increase not acceptable for ammonia
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	0.05	mg/l		0.3		

		SS		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				23.9108	mg/l		27.6331		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	5	mg/l		5		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		breaches Salmonid in low flow, not acceptable
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	30.00	mg/l		35.00		

		BOD		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				4.0988	mg/l		19.2276		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	1.3	mg/l		1.3		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		breaches Salmonid in low flow, not acceptable
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		25		

		COD		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)					mg/l				
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	no monitoring data supplied by applicant, appellant or Wicklow County Council					
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	50.00	mg/l		100		no data to support changing

		Chloride		Discharge Licence Limit		APPELLANTS REQUESTED ELV		APPELLANTS REQUESTED ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				14.2693	mg/l		192.0319		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	12	mg/l		12		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	15.00	mg/l		250		not acceptable

		NO3-N		Discharge Licence Limit		EPA 2006 Suggested ELV		EPA 2006 Suggested ELV	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				4.8206	mg/l		9.1566		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	2.5	mg/l		2.5		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		CLOSE to limit for average Quarry Discharge and LOW River Flow
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.70	mg/l		11.3		

		DRO		Discharge Licence Limit		EPA 2006 Suggested ELV (Total Hydrocarbons)		EPA 2006 Suggested ELV (Total Hydrocarbons)	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				3.7822	mg/l		0.7564		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.00001	mg/l		0.00001		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		1		EPA 2006 limit more reasonable

		Mineral Oil		Discharge Licence Limit		EPA 2006 Suggested ELV (Total Hydrocarbons)		EPA 2006 Suggested ELV (Total Hydrocarbons)	
T = (FC+fc)/(F+f)		T							
T = RESULTANT concentration in the receiving water (mg/l)				3.7822	mg/l		0.7564		
F = upstream receiving river flow, Average flow (m ³ /s)		F		0.003	m ³ /s		0.003		
Q (m ³ /d)	805	C = background/upstream concentration in receiving water (mg/l)	C	0.00001	mg/l		0.00001		
Q (m ³ /s)	0.0093171	f = DISCHARGE flow discharging to receiving waters (m ³ /s)	f	0.00931713	m ³ /s		0.00931713		
		c = DISCHARGE concentration discharging to the receiving waters (mg/l)	c	5.00	mg/l		1		EPA 2006 limit more reasonable