Annual Environmental Report 2017 for Crystalhill Inns Ltd T/A CHI Environmental Grannagh, Kilmacow, Co. Kilkenny licence number W0260-01

Table of Contents

INTRODUCTION

This Annual Environmental Report provides information on environmental compliance at the CHI Environmental Soil Recovery Facility, Grannagh, Kilmacow, Co. Kilkenny.

The Environmental Protection Agency issued licence number W0260-01 to Crystalhill Inns Ltd T/A CHI Environmental on the 25th of May 2016. This report covers the reporting year from the 1st of January 2017 to the 31st of December 2017

In accordance with Schedule E of the Waste Licence (W0260-01) an Annual Environmental Report (AER) is to be prepared and submitted yearly.

1. ENVIRONMENTAL MONITORING AT THE FACILITY

1.1 Environmental Monitoring at CHI Environmental Soil Recovery Facility.

During the year 2017 environmental monitoring was undertaken at the site in accordance with conditions of waste licence W0260-01.

The following environmental parameters were monitored in accordance with conditions Schedule C:

- Dust (2 Monitoring Points – D1, D2- twice annually)
- Ground Water (3 Monitoring Points – GW1, GW2, GW3 annually)
- Noise (3 Monitoring Points – N1, N2, N3 annually)
- Deposited soil

See drawing appendix 1 for site layout.

1.1.2 Dust Monitoring

Dust Deposition Monitoring was undertaken twice annually in 2017 as per the WFP W023E/ 2007 and Schedule C of the Licence W0260-01.

Dust monitoring taken in relation to the Licence from the 1st of May to the 31st of May and from the 1st of September to the 30th of September.

Dust deposition monitoring was based on the modified version of the Bergerhoff Method VDI2119 – “Measurement of Dustfall using the Bergerhoff Instrument” (Standard Method). A 30 day composite sample with results expressed as mg/ m2/day.

Dust Deposition Limits – 350mg/m2/day.

2016 - Dust Deposition Results Summary

Sampling Date	***Location***	***Dust Deposition Result (mg/m2/day)***	***Limit (mg/m2/day)***
31/05/17	*DS1*	***101.6***	*350*
	DS2	***193.8***	

Sampling Date	***Location***	***Dust Deposition Result (mg/m2/day)***	***Limit (mg/m2/day)***
30/09/17	*DS1*	***99.1***	*350*
	DS2	***108.3***	

1.1.3 Ground Water and Deposited Soil Monitoring

In accordance with Schedule C of the Waste Licence, Ground water sampling was carried out at 3 points across the site.

In accordance with Schedule C of the Waste Licence, Deposited soil sampling was carried out at 3 points across the site.

See Appendix 2 containing S.M. Bennett consulting report on soil and ground water analysis.

1.1.4 Noise Monitoring

Noise Monitoring was undertaken at the facility during 2017 at 3 points as required as part of schedule C.2 Noise Monitoring.

See Appendix 3 containing BHP Laboratories report on noise monitoring analysis.

1.1.5 Surface Water Monitoring

Surface water monitoring was not undertaken in the period. No surface water is currently discharged from any permeable surface on the site. A report has been submitted to the Agency for review with proposal to change this and once agreed surface water sampling can be carried out.

2. WASTE MANAGEMENT AT THE FACILITY

2.1 Waste Management and Recovery at the facility

Only waste fill conforming to European Waste Catalogue Codes granted to the facility was accepted at the facility during 2017. All waste to the facility was recorded and once agreed with our inspector weighed over the certified weighbridge at the site entrance. The majority of waste fill accepted at the facility emanated from construction works within the south Kilkenny and Waterford city area.

The following table shows the sites permitted intake:

EWC CODE	WASTE TYPE Notes 1 & 2	MAXIMUM (TONNES PER ANNUM)
17 05 04	Soils and stones other than those mentioned in 17 05 03	125,000
17 05 06	Dredge spoil other than those mentioned in 17 05 05	
17 05 08	Track Ballast other than those mentioned in 17 05 07	
17 01 01	Concrete	45,000
17 01 02	Bricks	
17 01 07	Mixtures of concrete, bricks, tiles and ceramics (other than those mentioned in 17 01 06)	
17 03 02	Bituminous mixtures other than those mentioned in 17 03 01*	
17 09 04	Mixed construction and demolition wastes	
Total		170,000

W026-01 Permitted EWC and Tons

The site uses the waste soil to recover the fill area while the concrete, bituminous mixtures and Mixed C&D is recycled on site. Currently there is an article 28 application with the agency with regard to the recycling of concrete material on site to produce an aggregate product. The recycling material is currently either stockpiled on site or sent to further waste licence or permitted facilities.

Total Waste Handled in 2017- CHI Environmental (W0260-01)

TOTAL WASTE HANDLED in 2017:	135690 Tonnes

Breakdown EWC category Tonnage to CHI Environmental

EWC Code	Tonnes
17 05 04	107284
17 01 01	7984
17 03 02	3229
17 09 04	17193
Total 2015	**135690**

Wastes removed from Site

Date	Waste Description	EWC Code	Tonnes	Destination / Authorisation No.
21/09/2016	Mixed Waste from Waste Storage Area	17 09 04	14.3	Starrus Eco Holdings Ltd Six Cross Rd Waterford W0166-01

2.2 Waste Recovery

All waste soil fill taken to the site was recovered at the facility. The careful placement of fill and the subsequent reseeding, rolling etc. ensured that the resultant ground was agriculturally viable.

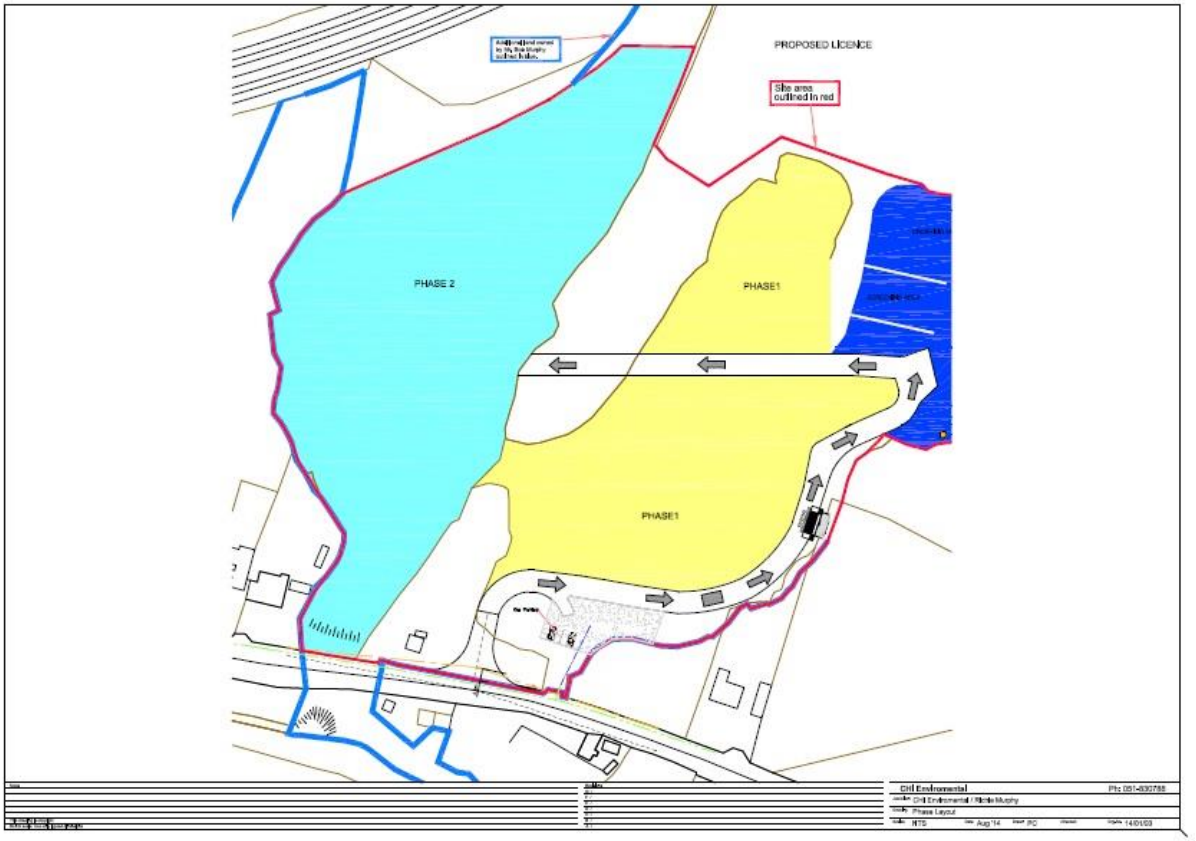
No waste loads were rejected from the facility during 2017. All waste accepted at the site was in compliance with conditions of the Waste Licence.

Some extraneous individual items of non-complaint materials were extracted from loads during offloading at the Recycling Area. These items included pieces of plastic piping / ducting, geo-textiles, reinforcing steel bars, waste timber etc. These wastes were segregated and items were placed in 30 cu y skip located in the on-site Waste Quarantine Area. The material was collected by and brought to the Greenstar Waste facility in Waterford city (W0166-01) for recovery as per table.

3. SITE WORKS

3.1 Progress of Waste Deposition Works

The site was approximately 8*0%* by volume filled by end of 2017. All wastes taken to the site have been deposited in accordance with the phased filling plan. Phase 1 (the eastern section of the site) is nearing completion. Reseeding and the rendering of filled areas as suitable for agriculture have been undertaken in sub-phases of Phase 1. This ensured that the amount of exposed bare earth was limited to only fresh fill and it also reduced the impact from dust to the atmosphere and suspended solids to the drainage system and freshwaters.



Phase layout

3.2 Expected Project Completion Date

The expected completion date for the project is unknown at this date as it is dependent on the upcoming availability of suitable volumes of fill in the catchment area.

3.3 Topographical Survey

A topographical survey was undertaken in December 2017 by Byrne & McCabe engineers. See attached appendix 4 for the report and the accompanying drawing.

3.4 Stability Assessment

A stability assessment was undertaken in December 2017 by Byrne & McCabe engineers. See attached appendix 4 for the report.

4. RESOURCE MANAGEMENT AT THE FACILITY

4.1 Resource Consumption, Use and Energy Efficiency Report

All items of plant used at the facility are powered by diesel combustion engines. A tracked bulldozer was utilised to place and level incoming fill material at the facility. A Tracked excavator, crusher and screener as well as a wheel loader is used in the recycling area. Electricity and water is used only in the office and canteen on site, these are very low usage.

Total Fuel Usage in 2016

TOTAL FUEL USED in 2017:	35,100 Litres

5. COMPLAINTS SUMMARY

5.1 Complaints

Details of all complaints made by the public are recorded in a Complaints Register. Complaints can be registered by contacting management or staff at the site. The register includes the name of the complainant, the nature of the complaint, the date of the complaint and the actions taken to remedy the complaint. The Managing Director / Facility Manager must sign off all completed forms.

There were no complaints received during the reporting period.

6. ENVIRONMENTAL MANAGEMENT AT THE FACILITY

6.1 Schedule of Environmental Objectives and Targets

- To comply fully with the conditions of EPA Waste Licence W0260-01
- To comply with applicable environmental legislation and best industry practice
- To be a good neighbour
- To achieve continuous improvement in environmental performance
- Conserve resources by making efficient use of energy and raw materials
- Be committed to good environmental management

6.2 Environmental Management Programme – Report for 2016

As the licence only began in 2016 the EMP has only recently been developed. In 2016 sound berm was added along the north side of the recycling area so as to reduce visual impact to some neighbours. This has been grass seeded and this is now established.

6.3 Environmental Management Programme – Proposal for 2017

As this is the first full year of the licence it is proposed to undertake a review of the EMP and to undertake any steps developed through that review on site.

7. TANK AND PIPELINE TESTING AND INSPECTION REPORT

7.1 Tank and Pipeline Testing / Inspection

There are no items requiring testing or inspection at the facility. No oils or fuels are stored on the site. No chemicals are stored at the facility. Re-fueling is undertaken using mobile fuel bowser (self-bunded).

There are a number of weekly inspections undertaken at the site in relation to plant maintenance and other items. These are kept on file at the site office.

8. REPORTED INCIDENTS SUMMARY

8.1. Reported Incidents Summary

There were no reportable incidents at the facility during 2016.

9. FACILITY MANAGEMENT

9.1 Management and Staffing Structure at the Facility

CHI Environmental currently employs 4 full time and 4 part time staff. Bob Murphy is managing director of the company. The facility is managed by Mr. Richard Murphy with Mr. Nicky Murphy as Assistant Manager.

10. REVIEW OF CLOSURE, RESTORATION AND AFTERCARE MANAGEMENT PLAN (CRAMP)

10.1 CRAMP Review

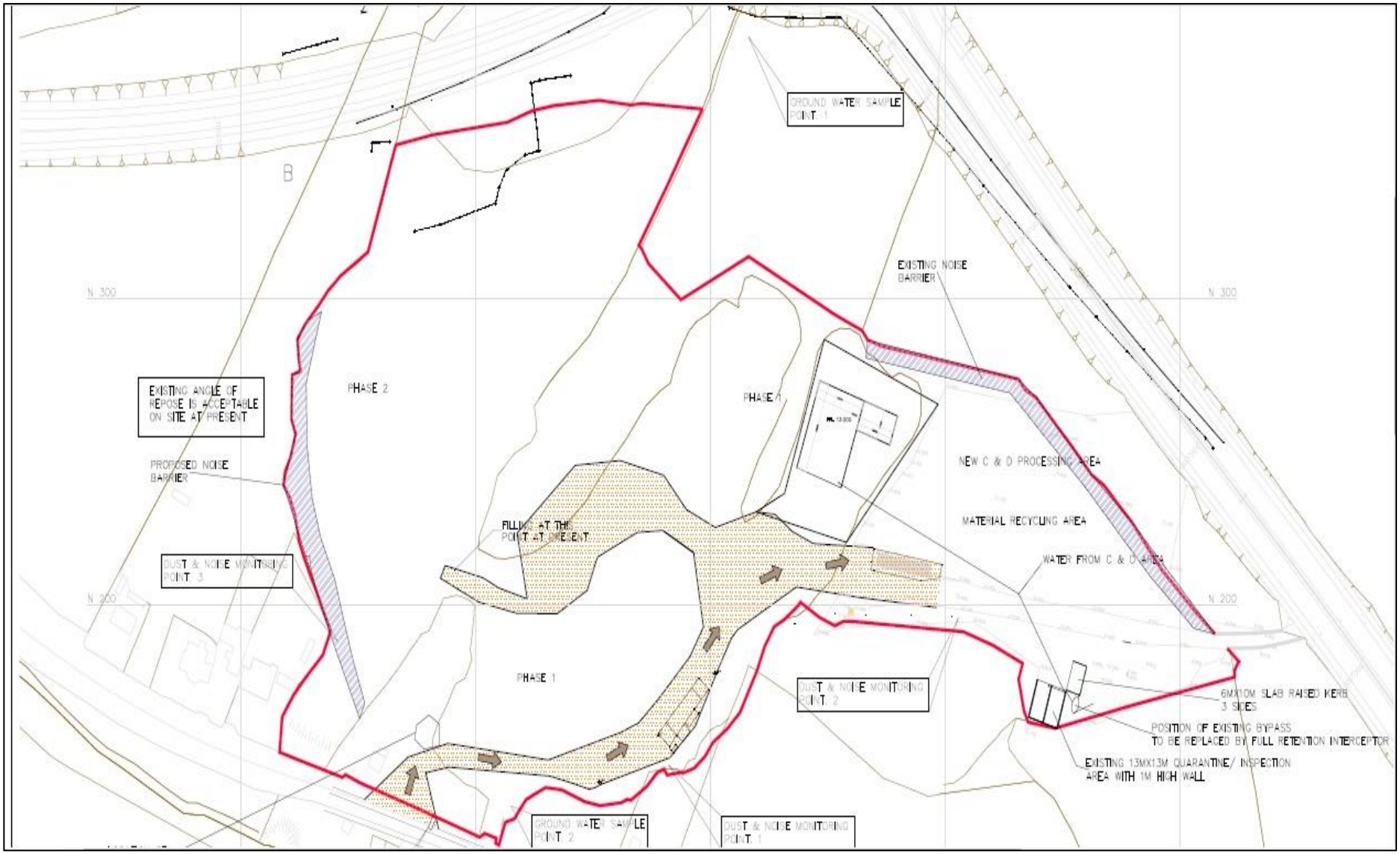
A comprehensive Closure, Aftercare and Management Plan (CRAMP) is in place for the facility having been developed by Kingfisher Environmental Consultants. The plan was developed once the Licence was granted in 2016 and this has been submitted to the Agency for review. It is deemed at this time to need no alterations.

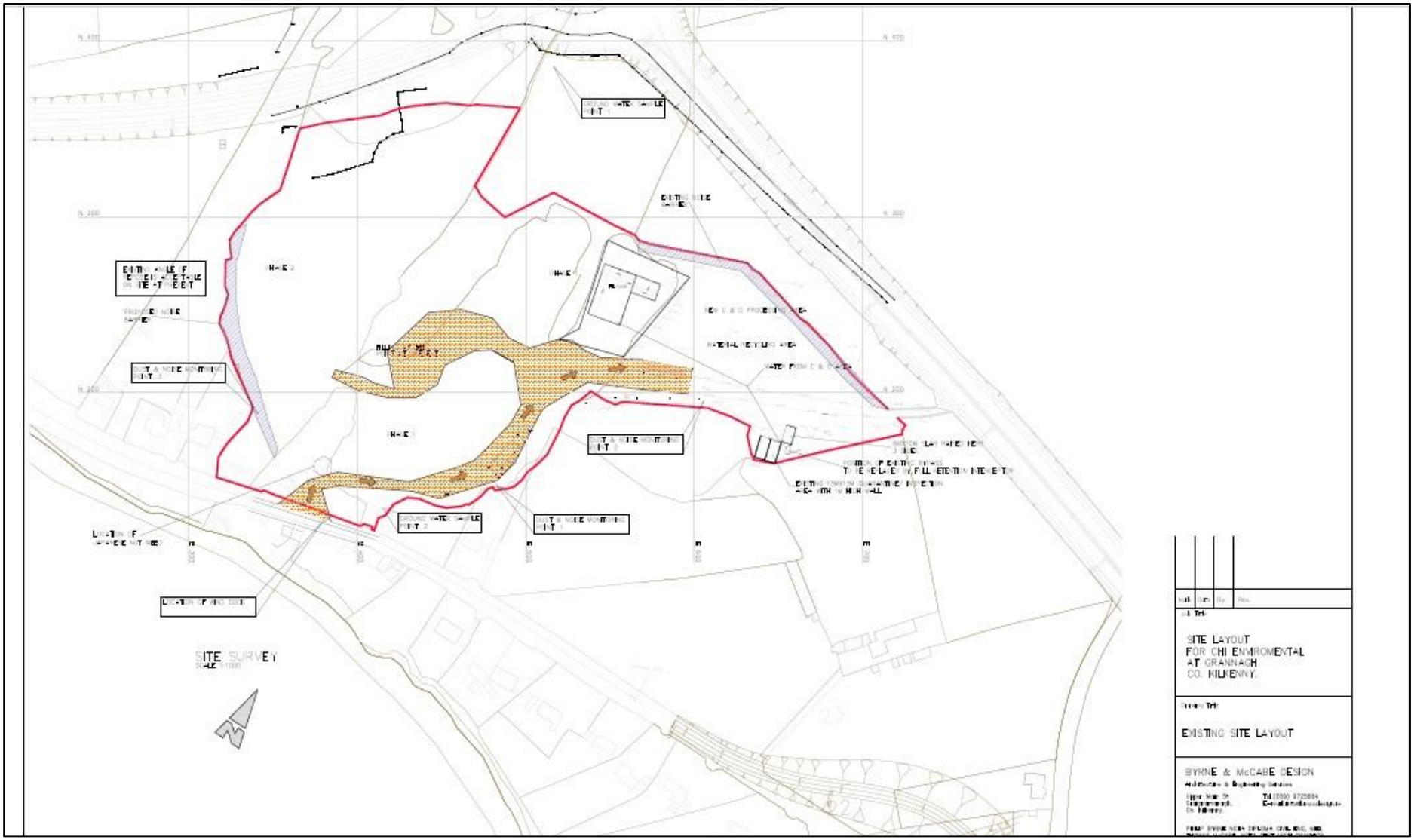
11. ENVIRONMENTAL LIABILITIES RISK ASSESSMENT REVIEW

11.1 ELRA Review

An Environmental Liabilities Risk Assessment ELRA has been carried out by Kingfisher Environmental Consultants. The assessment was carried once the Licence was granted in 2016 and this has been submitted to the Agency for review. It is deemed at this time to need no alterations.

Appendix 1 Site Layout Drawing


GROUND WATER SAMPLE POINT 1
EXISTING NOISE BARRIER
N 300
N 300
EXISTING ANGLE OF REPOSE IS ACCEPTABLE ON SITE AT PRESENT
PHASE 2
PHASE 1
PROPOSED NOISE BARRIER
NEW C & D PROCESSING AREA
MATERIAL RECYCLING AREA
FILLING AT THIS POINT AT PRESENT
DUST & NOISE MONITORING POINT 3
WATER FROM C & D AREA
N 200
N 200
PHASE 1
DUST & NOISE MONITORING POINT 2
6MX10M SLAB RAISED KERB 3 SIDES
POSITION OF EXISTING BYPASS TO BE REPLACED BY FULL RETENTION INTERCEPTOR
EXISTING 13MX13M QUARANTINE/ INSPECTION AREA WITH 1M HIGH WALL
GROUND WATER SAMPLE POINT 2
DUST & NOISE MONITORING POINT 1


SITE SURVEY
SITE LAYOUT
FOR CHI ENVIROMENTAL
AT GRANNAGH
CO. KILKENNY.
EMSTING SITE LAYOUT
BYRNE & McCABE DESIGN

Appendix 2 S.M. Bennet Soil & Ground Water Report

ANNUAL SOIL & GROUNDWATER MONITORING REPORT

Date of Issue: 30th March, 2018

FAO Mr. Ritchie Murphy,
CHI Environmental,
Grannagh,
Kilmacow
County Kilkenny.

Our Ref: rt300318chigran2.15
Your Ref: (S&GW Report)

1 SUMMARY

This annual report examines soil and groundwater quality in respect of a former rock quarry at Grannagh, Co. Kilkenny. The results are compared with the EPA Threshold Values or equivalent groundwater quality indicators.

2 DESCRIPTION OF SOIL SAMPLING, SAMPLING METHODOLOGY & ANALYTICAL RESULTS

It is understood by the author that annual soil analysis commenced in 2017 as a result of an Agency stipulation. As communicated to the author, this section contains a description of the soil sampling points, the reported sampling methodology and a review of the analytical results.

2.1 Soil Sampling Points & Sampling Methodology

Three soil samples were by collected CHI Environmental on 21/Dec/2017 in the NE corner of the site as shown in the accompanying drawing (DWG CCF22032018). It is reported by CHI that the samples were grab samples collected at a shallow depth of just below land surface. The samples are identified as S1 Left, S2 Centre and S3 Right. The sample locations appear to have been located in an equidistant configuration on a shallow arc separated by a distance of ca. 20m. Grid references for the locations may be derived from DWG CCF22032018.

2.2 Soil Quality Indicator Parameters

Soil quality indicator parameters were selected based on existing inert soil and non-hazardous waste monitoring practice.

2.3 Soil Quality Analytical Results

Soil quality analytical results provided by BHP Laboratories are presented in summary form in Table 1/§2.3 as follows.

Table 1/§2.3 Grannagh Soil Quality Analyses

PARAMETER	UNITS	21.12.17			Inert	Non-Haz
		S1 (Left)	S2 (Centre)	S3 (Right)	Soil Limit	Waste Limit
Arsenic (as As)	mg/kg	<0.050	<0.050	<0.050	0.50	2
Barium (as Ba)	mg/kg	<0.50	<0.50	<0.50	20	100
Cadmium (as Ca)	mg/kg	<0.010	<0.010	<0.010	0.04	1
Chromium (as Cr)	mg/kg	<0.050	<0.050	<0.050	0.5	10
Copper (as Cu)	mg/kg	<0.050	<0.050	<0.050	2	50
Mercury (as Hg)	mg/kg	<0.0050	<0.0050	<0.0050	0.01	0.2
Molybdenum (as Mo)	mg/kg	<0.050	<0.050	<0.050	0.5	10
Nickel (as Ni)	mg/kg	<0.050	<0.050	<0.050	0.4	10
Lead (as Pb)	mg/kg	<0.010	<0.010	<0.010	0.5	10
Antimony (as Sb)	mg/kg	<0.010	<0.010	<0.010	0.06	0.7
Selenium (as Se)	mg/kg	<0.010	<0.010	<0.010	0.1	0.5
Zinc (as Zn)	mg/kg	<0.50	<0.50	<0.50	4	50
Chloride (as Cl)	mg/kg	37	15	<10	800	15,000
Fluoride (as Fl)	mg/kg	3.7	4.6	3.5	10	150
Sulphate (as SO_4)	mg/kg	140	97	44	1,000	20,000
Solids (tot. diss.)	mg/kg	500	450	420	4,000	60,000
Phenol (index)	mg/kg	0.50	<0.50	<0.50	1	-
Carbon, Organic (diss.)	mg/kg	110	85	81	500	800
BTEX	mg/kg	<0.010	<0.010	<0.010	6	-
Carbon, Organic (tot.)	%	0.36	0.22	0.29	3%	-
PCBs (sum x7 congeners)	mg/kg	<0.10	<0.10	<0.10	1	-
Mineral Oil (C_{10} - C_{40})	mg/kg	<10	56	<10	500	-
PAHs (sum x17)	mg/kg	<2.0	<2.0	<2.0	100.00	-
pH	pH units	8.2	8.3	8.1	-	-
Acid buffering capacity	mol/kg	0.04	0.02	0.01	-	-
Loss on ignition	%	2.3	2.4	2.2	-	-
Dry Matter Content	%	89	89	87	-	-

Analytic results in bold text indicate elevated concentrations

2.4 Soil Quality Analytical Review

In accordance with industry practice, laboratory analysis of the three soil samples was undertaken by an accredited and reputable laboratory for the twenty-seven monitoring parameters presented in Table 1/§2.3. Analytical results were compared with Inert and Non-Hazardous Waste monitoring values provided courtesy of BHP Laboratories.

None of the soil quality analyses exceeded or approached their respective Inert monitoring value.

3 HYDROGEOLOGY, RATIONALE, SAMPLING METHODOLOGY & GROUNDWATER QUALITY REVIEW

This section contains a description of the groundwater sampling points, their location and the reported methodology employed during sampling.

3.1 Hydrogeology

The following description of the site hydrogeology is reproduced from the S.M. Bennet & Co Ltd. report issued 28/April/2015.

The area of Grannagh is hydraulically bounded to the SE by the River Suir and to the NE by the River Blackwater. Land surface elevations are ca. 20m OD and the base of the original quarry is reported to have been below the adjacent water level in the River Suir which is estimated at ca. 2m OD and tidally-influenced.

Whilst there is no doubt that, generally speaking, regional groundwater is moving from NNW to SSE and towards the Suir, tidal influences, floods and low water table may cause temporal flow reversal in the immediate vicinity of the river.

Nonetheless, in an overall sense, if there were any indications of the presence of leachate in groundwater either from the old dump adjacent to the east or from the quarry infill programme, one would expect to see elevated concentrations of associated chemical indicators in PT2 when compared with PT1.

3.2 Groundwater Sampling Points

The groundwater data under review has been provided by BHP Laboratories analysis of those groundwater samples collected from the three monitoring boreholes identified in Table 2 / §3.2.

Table 2 / §3.2
Groundwater Monitoring Boreholes

ID	Location	Grid Reference
PT-1	Northern Site Boundary (Midpoint)	S57736 15008
PT-2	Southern Site Boundary (Adj. Car Park)	S57682 14713
PT-3	Southern Site Boundary (Adj. Residence)	S57992 14798

It has been reported that PT-1 and PT-2 are dedicated monitoring boreholes of 30m and 40m in depth respectively. PT-3 is a household supply well the depth of which has not been ascertained but is estimated as being commensurate with that of a PT-1. No static water levels are available at this time.

PT-1 and PT-2 are purpose-installed groundwater monitoring boreholes bored into limestone rock. PT-3 is a drilled domestic well likely to be of a similar construction. Well diameters are expected to be ca. 150mm and are capable of accommodating a standard submersible pump.

3.3 Sampling Methodology

Pre-sampling preparation of PT-1 and PT-2 is undertaken by CHI Environmental staff and reportedly consists of purging using a submersible pump. The water sample is collected directly from the discharge after a short time interval.

PT-3 is in constant use as a domestic supply. Treatment is absent and water samples are collected from a direct well feed.

3.4 EPA Groundwater Pollution Indicators

In respect of point source indicators arising from landfill and similar sites such as the quarry reinstatement at Grannagh, specific groundwater pollution indicators have been defined by the Environmental Protection Agency (Daly, D. & Craig, M., 2010, P5. *Methodology for Establishing Groundwater Threshold Values & the Assessment of Chemical & Quantitative Status of*

Groundwater, including an Assessment of Pollution Trends and Trend Reversal. Johnstown: EPA. Such identifiers are listed below in Table 3 / §3.4.

Table 3 / §3.4
EPA Groundwater Pollution Identifiers (Daly & Craig, 2010)

Aluminium	Cyanide
Ammonia	Lead
Arsenic	Mercury
Boron	Nitrate
Cadmium	Nitrite
Chloride	Organics (selected)
Chromium	Sodium
Conductivity, Electrical	Sulphate
Copper	

Additional landfill-associated indicators in water and included in the recent analysis are listed in Table 4 / §3.4 as follows:

Table 4 / §3.4
Supplementary Groundwater Pollution Identifiers

BOD	Phosphorus
COD	Potassium
TOC	TDS
Iron	Zinc
Magnesium	Coliforms
Manganese	E. coli.
Nickel	DROs
Nitrite	PROs
Total Nitrogen	Mineral Oils
Orthophosphate	TPHs
pH	

3.5 Groundwater Quality Indicator Values (Threshold Values)

The quarry is not lined and it is expected that vertical percolation is the natural mechanism by which infiltrating rainwater reaches the water table. The underlying bedrock beneath the immediate area is Dinantian, Lower Impure Limestone (DLIL), a limestone/shale overlying the Kiltorcan Old Red Sandstone which is exposed further to the south. As stated in the EIS, the aquifer classification is: LI, a Locally Important Aquifer that is moderately productive only in Local zones.

The bedrock aquifer in the underlying water body receives recharge by infiltration. The supply of potable water supplies is regarded as the most sensitive use of this aquifer. As a consequence and notwithstanding the presence of naturally-occurring elevated concentrations, the TVs (Threshold Values) that this author has applied to the receiving body for assessing groundwater quality are the drinking water quality standards listed in Schedule 5 of the Groundwater Regulations.

Either arising from the presence of naturally-occurring elevated concentrations or other circumstances, the reader is advised that aquifer pollution may not necessarily be occurring where one or more TVs have been exceeded.

3.6 Groundwater Quality Review

The laboratory analytical results for the EPA Groundwater Pollutant Identifiers (GPIs) and a number of supplementary parameters that were reported for the samples collected in this most recent round of sampling undertaken on 21/December/2017 are presented in summary form in Table 4 / §3.6.

GPIs: Metals & Standard Chemicals

No Threshold Values (TVs) have been exceeded for Metals & Standard Chemicals in the December 2017 round of sampling. All of the supplementary parameters introduced have tested either below detection or well below their respective TVs. A similar observation was made in respect of the groundwater sampling undertaken December 2016.

GPIs: VOCs & Petroleum Compound Indicators

No Threshold Values (TVs) have been exceeded for VOCs & Petroleum Compound Indicators in the December 2017 round of sampling.

GPIs: Microbacteria

A Total coliform colony count of 276 per 100ml was reported by BHP Laboratories for the groundwater sample collected from PT-1 on 21st December, 2017. The equivalent recorded in PT-1 for 2016 was 3 counts per 100ml and annual zero counts were recorded for previous years. Escherichia coliforms in PT-1 of 2 counts per 100ml were recorded in 2017. Zero counts were recorded for previous years.

A Total coliform colony count of 83 per 100ml was reported by BHP Laboratories for the groundwater sample collected from PT-2 on 21st December, 2017. The equivalent recorded in PT-2 for 2016 was 166 counts per 100ml and annual zero counts were recorded for previous years. Escherichia coliforms were not detected in PT- 2 in 2017. An E. coli count of 8 per 100ml was recorded in 2016 with zero counts in previous years.

Neither Total coliforms nor Escherichia coli were detected in PT-3 in 2017.

4 CONCLUSIONS

4.1 Groundwater Quality Conclusions

With the exception of microbacterial indicators, the analytical results for groundwater quality at Grannagh continue to confirm the absence of groundwater pollution beneath this site.

Microbacteria results for PT-1 identify significant coliform colony counts and the presence of faecal bacteria. This is inconsistent and contrasts strongly with previous annual results for PT-1. Conversely, it appears that water quality in respect of microbacteria has improved dramatically in respect of PT-2.

Similar to PT-1, water quality in PT-3 appears to have returned to a satisfactory potable standard since 2016.

Arising from the observed inconsistencies in microbacterial water quality results over the past three years, it may be concluded that either conditions are variable or that the sampling methodology in respect of microbacteria requires review.

Table 5 / §3.6
Groundwater Monitoring Results at Grannagh (CHI Environmental) 21/December/2017

Parameter	Units	Groundwater Sampling Points														
		PT-1					PT-2					PT-3				
		9.10.12	12.3.14	3.2.15	15.12.16	21.12.17	12.10.12	12.3.14	23.1.15	15.12.16	21.12.17	26.1.15	15.12.16	21.12.17	TVs
Aluminium (total as AL)	mg/l	-	-	-	<100	<0.1	-	-	-	<100	<0.1	-	<100	<100	200
Ammonia, (total as N)	mg/l	<0.2	<0.2	<0.2	<0.1	<0.122	0.344	<0.2	0.203	<0.1	<0.1	<0.2	<0.1	<0.12	0.23
Arsenic (total as As)	µg/l	0.322	0.308	0.399	<1	<1	0.466	0.686	535	<1	<1	0.218	<1	<1	10
Boron (total as B)	µg/l	68.1	37.3	32.3	<230	<230	98.7	105	107	<230	<230	28.5	<230	<230	1,000
BOD	mg/l	-	-	-	<2	1.1	-	-	-	<2	1.1	-	<2	0.9	2.0
Cadium (dissolved as Cd)	µg/l	<0.1	<0.1	<0.1	<0.6	<0.6	0.551	0.432	0.485	<0.6	<0.6	<0.1	<0.6	<0.6	5.0
Carbon, Total Organic	mg/l	-	-	-	8.6	<0.7	-	-	-	7.2	1.5	-	2.5	<0.7	-
Chloride	mg/l	47.9	41.8	26.7	51	62	69.6	102	82.9	123	91	19.2	23	28	250
Chromium (total as Cr)	µg/l	2.15	10.6	2.02	3.4	<2	2.22	<3	2.58	2	<2	0.961	2.0	<2	50
COD	mg/l	-	-	-	<15	<15	-	-	-	<15	<15	-	<15	<15	40
Conductivity	µS/cm@20°	646	629	674	895	896	1,004	1,320	1,050	1,218	1166	353	527	720	1,500
Copper (dissolved as Cu)	µg/l	<0.85	0.99	35.4	<9	<9	1.69	2.71	0.97	<9	27.1	7.05	<9	26.7	2,000
Cyanide	µg/l	<50	<50	<50	<9	<9	<50	<50	<50	<9	<9	<50	<9	<9	50
Iron (dissolved as Fe)	mg/l	-	-	-	<0.23	<0.23	-	-	-	<0.23	<0.23	-	<0.23	<0.23	2.0
Lead (dissolved as Pb)	µg/l	<0.02	0.102	1.09	<6	<6	0.063	0.198	0.118	<6	<6	0.092	<6	<6	10
Magnesium (dissolved as Mg)	mg/l	-	-	-	25.1	26.8	-	-	-	18.8	<0.6	-	<0.6	<0.6	-
Manganese (dissolved as Mn)	µg/l	-	-	-	<7	<7	-	-	-	18.8	7		<7	<7	50
Mercury (dissolved as Hg)	µg/l	0.0404	0.0526	<0.01	<0.1	<0.01	<0.01	0.0131	<0.01	<0.1	<0.01	<0.01	<0.1	<0.01	1.0
Nickel (dissolved as NI)	µg/l	-	-	-	3.1	<3	-	-	-	5.3	3	-	<3	<3	20
Nitrate (as N)	mg/l	3.58	2.96	11.2	3.59	4.52	5.68	2.69	4.1	2.7	1.9	3.9	3.5	2.9	11.3
Nitrite (NO_2)	mg/l	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15
Nitrogen, Total (as N)	mg/l	-	-	-	3.4	4.8	-	-	-	2.5	2.8	-	3.6	3.6	-
Orthophosphate (total as P)	mg/l	-	-	-	<0.01	0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	0.01
pH	-	-	-	-	7.28	7.1	-	-	-	7.11	6.86	-	7.76	7.47	-
Phosphorus (total as P)	mg/l	-	-	-	<0.075	<0.075	-	-	-	<0.075	<0.075	-	<0.075	0.11	2.2
Potassium (total as K)	mg/l	-	-	-	-	1.14	-	-	-	-	8.91	-	-	0.497	-
Sodium (total as Na)	mg/l	26.6	19.4	13.6	22.8	26.5	41.4	62.7	49.7	49.5	45.9	98.6	100	157	150
Sulphate (as SO_4)	mg/l	81.6	19.3	16.1	65	39	144	287	139	141	128	60.3	57	90	250
Solids, Total Dissolved	mg/l	-	-	-	550	608	-	-	-	746	723	-	338	473	-
Zinc (dissolved as Zn)	µg/l	-	-	-	<18	<18	-	-	-	<18	85.5	-	<18	85.2	1,000
Coliforms, Total	MPN/100ml	-	-	-	3	276	-	-	-	166	63	-	4	ND	<100
E. Coli	MPN/100ml	-	-	-	ND	2	-	-	-	8	ND	-	ND	ND	0
Diesel Range Organics (C_{10}-C_{20})	mg/l	-	-	-	<0.01	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	0.01
Petrol Range Organics (C_6-C_{10})	mg/l	-	-	-	<0.01	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	0.01
Mineral Oils (C_{10}-C_{40})	mg/l	-	-	-	<0.01	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	0.01
Total Petroleum Hydrocarbons (C_6-C_{40})	mg/l	-	-	-	<0.01	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	0.01

A bold underlined result indicates either an elevated concentration or where a Threshold Value has been exceeded.

4.2 Soil Quality Conclusions

It is concluded from the sampling and accompanying analytical programme that soil quality beneath this site does not indicate the presence of contamination.

5 RECOMMENDATIONS

The following recommendations are made in respect of the soil and groundwater sampling programme for 2018.

Microbacterial Sample Collection Procedure

The potential for airborne and other pathways of sample contamination must be minimised. Bacteria samples must be collected at the end of sample collection and after a significant volume of discharge has already occurred. Vials must be sterilised and a blowlamp used during sampling. Sampling equipment must be stored in a clean airtight bag when not in use. Its use for other purposes must not be permitted.

Field Filtration

Field filtration of all water samples prior to dispatch is recommended.

Field Preservation

Water samples must be preserved at <4° Celsius following collection and delivered to the laboratory within 24 hours.

Hydrometric Data

It is recommended that static water levels, purge volumes and other relevant sampling details should be recorded for each monitoring point at sampling.

Sterilisation

The practice of sterilisation of boreholes with 11% sodium hypochlorite has been discontinued.

Contemporary Sample Collection

It is recommended that sample collection from the three boreholes takes place within not more than few hours.

Month of Sampling

Samples were collected immediately prior to the Christmas/New Year holidays which resulted in a significant internal delay prior to analysis. For 2018 it is recommended that samples are collected and submitted to the laboratory by not later than mid-November so as to ensure a normal turnaround time.

This concludes this report.

On behalf of S.M. Bennet & Co. Ltd, *Hydrogeology & Environment*

PGeo Shane Bennet *EurGeol, MSc., MEd.,*
Principal Hydrogeologist

Appendix 3 BHP Laboratories Noise Report

BHP/CEM/23/A

Analysing
Testing
Consulting
Calibrating

TEST REPORT 145246

Client:
CHI Environmental Ltd
Grannagh
Kilmacow
Co. Waterford

FAO: Richie Murphy

BHP Ref No.: 17/12/1929
Order No.:
Date Received: 14th & 21st December 2017
Date Tested: 14th & 21st December 2017
Test Specification: Noise Monitoring

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail
dervlapurcell@bhp.ie

Item: ***Noise survey at noise sensitive locations at CHI Environmental Ltd, Kilmacow, Co Waterford***

For and on behalf of BHP Ltd.

Dervla Purcell
Date Issued: 4th January 2018
Supplement to report No. N/A

Contents

1.0 Scope of survey

At the request of CHI Environmental Ltd BHP undertook noise monitoring at their operation in Kilmacow, Co.Waterford. The purpose of this survey was to provide CHI Environmental with the noise data and analysis required as part of their planning requirements.

This report deals with three nominated noise locations at the operation in Kilmacow, Co. Waterford for 2017.

2.0 Survey approach

Two sound level meters (SLM's) were used in the survey, a Cirrus 171C type 1 (serial number G068852) and a Cirrus 831C type 1 (serial number D21298FF). The SLM's were calibrated at the start of the survey with a CRL 515 calibrator (serial number 74767). The same calibrator was used to check the SLM at the end of the survey, to inspect the microphone drift.

Monitoring and the interpretation of acquired data is to the following standards:

- British Standard: BS 7445 Part 1: 1991 (ISO 1996-1: 1982) Description and measurement of Environmental Noise. Part 1. Guide to quantities and procedures.
- British Standard: BS 7445 Part 2: 1991 (ISO 1996-2: 1987) Description and measurement of Environmental Noise. Part 2. Guide to the acquisition of data pertinent to land use.
- British Standard: BS 7445 Part 3: 1991 (ISO 1996-3: 1987) Description and measurement of Environmental Noise. Part 3. Guide to application to noise limits.

30 minute daytime and evening levels were measured at 3 locations. 15 minute night time levels were measured at the same 3 locations. The locations were labelled as 1-3 and are identified on the map included in Appendix A.

Appendix B contains photographs of the monitoring points.

3.0 Date of Survey

The survey was carried out on the 21st of December 2017 for the daytime monitoring by Tara Foley and on the 14th of December for evening time by Dervla Purcell

4.0 Results

4.1 Noise levels:

Levels are presented on the following pages.

Day-time Measurements - Noise Locations – (21st December 2017)

Location	Sampling Interval	Duration (mins)	L_{AEQ} dBA	L_{A10} dBA	L_{A90} dBA	Wind speed m/s	Sampling notes
NSL1	11:44-12:14Hrs	30	53	56	48	1-2 N	Traffic from surrounding roads was constant and audible at 45-55dBA and up to 65dBA at times. Some quarry activity with the loader operating was barely audible above the road noise at 45-50dBA.
	12:14-12:44Hrs	30	55	58	50		
	12:44-13:14Hrs	30	53	56	46		
Location	**Sampling Interval**	**Duration (mins)**	**L_{AEQ} dBA**	**L_{A10} dBA**	**L_{A90} dBA**	**Wind speed m/s**	**Sampling notes**
NSL2	11:47-12:17Hrs	30	52	54	46	1-2 N	Traffic from surrounding roads was constant at 45-60dBA. General activity from the facility around the weighbridge was heard at 50dBA. Trucks entering and leaving the facility were audible at 55dBA
	12:17-12:47Hrs	30	53	55	47		
	12:47-13:17Hrs	30	51	54	44		
Location	**Sampling Interval**	**Duration (mins)**	**L_{AEQ} dBA**	**L_{A10} dBA**	**L_{A90} dBA**	**Wind speed m/s**	**Sampling notes**
NSL3	11:50-12:20Hrs	30	53	56	47	1-2 N	Traffic from surrounding roads was constant and audible at 45-60dBA. Trucks entering and leaving the facility were audible at 45-50dBA. Reversing sirens on the site could be heard at 50-52dBA
	12:20-12:50Hrs	30	55	57	48		
	12:50-13:20Hrs	30	52	54	47		

Evening-time Measurements - Noise Locations – (14th December 2017)

Location	Sampling Interval	Duration (mins)	L_{AEQ} dBA	L_{A10} dBA	L_{A90} dBA	Wind speed m/s	Sampling notes
NSL1	19:20-19:50Hrs	30	54	56	51	4-5 NW	No Activity from CHI facility. Passing road traffic audible at 48-52dBA and up to 54dBA at times. Wind gusting up to 58dBA on occasion.
Location	**Sampling Interval**	**Duration (mins)**	L_{AEQ} dBA	L_{A10} dBA	L_{A90} dBA	**Wind speed m/s**	**Sampling notes**
NSL2	19:17-19:47Hrs	30	59	58	53	4-5 NW	No Activity from CHI facility. Passing road traffic audible at 44-48dBA. Wind noise reached 50-55dBA with gusts at 59-62dBA. Location moved inside facility.
Location	**Sampling Interval**	**Duration (mins)**	L_{AEQ} dBA	L_{A10} dBA	L_{A90} dBA	**Wind speed m/s**	**Sampling notes**
NSL3	19:52-20:22Hrs	30	53	51	44	4-5 NW	No Activity from CHI facility. Passing road traffic audible at 43-48dBA. Wind noise reached similar levels as road noise.

5.0 Interpretation of results

5.1 Noise levels;

The noise limits for CHI Environmental Ltd, Co Waterford are as follows:

Daytime Limit	L_{Aeq} 55dBA
Evening time Limit	L_{Aeq} 50dBA

5.1.1 Day-time levels:

As can be seen in section 4.1, L_{Aeq} levels at the noise monitoring locations are less than the day time limit of 55dBA at all locations.

5.1.1 Evening-time levels:

As can be seen in section 4.1, L_{Aeq} levels at the noise monitoring locations are greater than the evening time limit of 50dBA at all locations. The facility was not active during the readings and main noise source was the road and wind noise. This is not considered an exceedance of the evening time limit of 50dBA.

6.0 Conclusions

The noise contribution made by the operation did not exceed the daytime or evening time limits at any of the noise monitoring locations.

Appendix A

Site map showing noise monitoring locations

Appendix B
Photographs of
Monitoring Locations

Noise monitoring location NSL1

Noise monitoring location NSL2

Noise monitoring location NSL3

Appendix 4 Byrne & McCabe Engineering Report

BYRNE & McCABE DESIGN

ARCHITECTURE & ENGINEERING SERVICES

Richard Murphy,
CHI Environmental,
Dunbrinn,
Grannagh,
Via Waterford.

Re:-Site survey December 2017 annual report.

Dear Richard,

This report is based on our survey on the 28th December 2016 updated 20th December 2017.

- We confirm we have checked the slope of the ground on site and can confirm it is acceptable at present.
- The approximate amount of fill between the dates above was 74,305

We confirm we survey the site on the 19th December 2017

Regards,

Byrne & McCabe Design

UPPER MAIN STREET, GRAIGUENAMANAGH, CO. KILKENNY

PARTNERS:
PHILIP BYRNE NCEA DIPLOMA.CIVIL ENGINEERING. M I.E.I
THOMAS MCCABE NCEA CERT. ARCH GRAPHICS, NCEA DIP.CONST STUDIES.
VAT NO: IE9554446 M

PHONE: 059 9725684
FAX: 059 9725684
E-MAIL: info@bmccdesign.ie