[TRADING AS DARRINGTON QUARRIES LIMITED]

CONCEPTUAL SITE MODEL, ENVIRONMENTAL SETTING AND SITE DESIGN REPORT (ESSD)

SKELBROOKE QUARRY EXTENSION AREA
STRAIGHT LANE
SKELBROOKE
DONCASTER
SOUTH YORKSHIRE
DN6 8LY

Document Reference: WR7640/05.R1
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Information Sheet

CONCEPTUAL SITE MODEL ENVIRONMENTAL SETTING AND SITE DESIGN (ESSD) SKELBROOKE QUARRY EXTENSION AREA, STRAIGHT LANE, SKELBROOKE, DONCASTER

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CONCEPTUAL SITE MODEL, ENVIRONMENTAL SETTING AND SITE DESIGN (ESSD) REPORT

CONTENTS

LIST OF DRAWINGS

WR7640/10/ESSD1	Site Location
WR7640/10/ESSD2	Environmental Site Setting
WR7640/10/ESSD3	Cultural and Natural Heritage
WR7640/10/ESSD4	Site Layout and Waste Deposition
WR7640/10/ESSD5	Restoration
WR7640/10/ESSD6	Regional Geology
WR7640/10/ESSD7	Hydrogeology Hydrology
WR7640/10/ESSD8	Hydrogeological Cross Sections
WR7640/10/ESSD9	Receptors and Pathways

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 Report Context

1.1.1 Sirius Environmental Limited (Sirius) has been commissioned by Darrington Quarries Limited ('DQL'), part of the FCC group of companies, to prepare an Environmental Permit Variation Application for the Environmental Permit: EPR/CP3994ZR to support a revised scheme of restoration for the former quarry at Skelbrooke Quarry Extension, Skelbrooke, Doncaster. DQL are seeking to commence an alternative restoration scheme for the extension area which will bring the ground levels within the flooded area to above that of current water levels within the void. This will also aid in surface water management for the wider restored Skelbrooke complex. As part of this application it is necessary to prepare an Environmental Setting and Site Design (ESSD) Report. This report has been prepared in accordance with Environment Agency's ESSD template report (Version 1, October 2016).

1.1.2 The waste recovery operations will restore the void created by previous limestone quarrying operations. In order to achieve the current approved scheme of restoration ~230,000 cubic metres of non-hazardous material will be deposited. This could be achieved over the period of a year or possibly longer, subject to waste availability. Note, under the previous approved scheme of restoration the modelled void capacity was estimated as ~235,100m^3. This volume has principally been reduced to provide greater flood attenuation and freeboard capacity in the surface water lagoon, in line with current guideline requirements. Furthermore, a review of materials balances will result in approximately 6,000m^3 of the 230,000m^3 being sourced from existing deposits at the site, reducing required import balance to ~224,000m^3. The imported material will comprise of low-risk waste principally sourced from areas local to the site to limit the pollution potential. The restoration proposals will also incorporate a wetland habitat that will also provide long-term flood attenuation for the surface water run-off from the capped, adjacent main landfill facility which is currently managed within the extension area.

1.1.3 As part of this application, a Hydrogeological Risk Assessment has been carried out. An Environmental and Accident Risk Assessment has also been undertaken which encompassed a qualitative amenity risk assessment. These risk assessments have been completed in accordance with the requirements of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

1.1.4 This report conceptualises the site in terms of the potential source pathway and receptors relationships to support the various risk assessments required to support the Environmental Permit Variation Application. These risk assessments (and relevant engineering and environmental controls) are presented in the relevant sections of the main application document.

1.2 Site Details

Location and Access

1.2.1 Skelbrooke Quarry Extension Area is located to the south of the village of Skelbrooke and approximately 500m to the northwest of the village of Skellow, South Yorkshire. The site is approximately 1km to the west of the A1 Great North Road, and 7.5km northwest of Doncaster. The application site has a postcode of DN6 8LY and is centred on National Grid Reference (NGR) of SE 510 116. The site is situated to the immediate east of a disused railway line.

The location of the Skelbrooke Quarry Extension Area relative to its surroundings is presented in **Drawing No's. WR7640/10/ESSD1** and **WR7640/10/ESSD2**. The Environmental Permit Boundary for the quarry extension area encompassed an area of ~8.1 Ha, of which restoration activities to which the revised proposals see permanent deposits of wastes placed over ~3.44 ha of the permitted site.

1.2.2 Access to the site is via Straight Lane located to the North of the Skelbrooke Quarry Extension Area, which connects to Hazel Lane to the South West and Doncaster Lane/Bannister Lane to the North East.

Site Classification

1.2.3 The application will vary the current permitted closed landfill activity to a waste recovery operation that involved the permanent deposit of waste.

Application Boundaries and Site Security

1.2.4 The extension area is depicted in **Drawing No.: WR7640/05/ESSD2.** The site is bounded to the east by Doncaster Lane, the northwest by Straight Lane, and the west and south by the restored main Skelbrooke Landfill Site. Beyond the site and wider former quarry and landfill complex the site is located within a generally rural location, comprising arable/pastoral agricultural land, interspersed with small towns and villages.

1.2.5 The sections of the extension area that have yet to be restored are secured with 7ft high palisade fencing. The main access point for the site is secure with 6 ft high security gates, whilst the boundary of the restored main landfill site is bounded with stock proof fencing, and semi-mature trees lines and hedgerows.

Adjacent Former Waste Management Licences

1.2.6 As previously alluded to, the main Skelbrooke Landfill site (regulated by Environmental Permit EPR/BV1470IE) is situated to the east/south east of extension area, which was permitted to receive hazardous, non-hazardous and inert wastes.

1.2.7 In addition to the above, the restored Doncaster Metropolitan Borough "dilute and attenuate" landfill site is situated to the southeast of the extensions, across Doncaster Lane. It is understood that this site was operational from 1976 and accepted household, commercial, industrial and difficult wastes. It is reported to have a capacity of 1 million m^3.

1.2.8 Bannister Lane Landfill, as well as Parkwood Landfill, both of which are now closed, are situated *c*. 660m and *c.* 1km to the North East of the site respectively.

1.2.9 There is a non-hazardous landfill situated *c*. 800m to the west of the site, which is currently operated by Catplant Quarry limited. The Environmental Permit (Permit Reference: BL4940IU) permits the landfilling of non-hazardous (and smaller fraction of inert) wastes to support the restoration of the mineral extraction void of Hazel Lane Quarry.

Site Context

1.2.10 The extension area forms part of wider former limestone quarry and landfill complex that has already been restored by landfilling under a separately

regulated landfill activity (refer to **Drawing No**. **WR7640/05/ESSD2** for clarification of Permit boundaries).

1.2.11 The closest properties to the site are within the neighbouring village of Skelbrooke, at the interchange between Straight Lane and Bannister Lane approximately 130m north of the current unrestored areas of the site. The village of Skelbrooke extends northwards from the northern corner of the extension area. The village of Hampole lies approximately 1.1km to the southeast of the site.

1.2.12 A tributary of The Skell (river) is situated *c*.320m to the East of the site, whilst the Hampole Dike is located ~1km to the south and Frickley Beck ~1.1km to the southwest. A tributary to the Skell flows north-eastwards from the site boundary.

1.2.13 The majority of the that requires restoration is flooded in which waters are in hydraulic connection with groundwater within the Magnesian Limestone Aquifer. groundwater levels within the surrounding geology (although the site also forms part of the surface water management system for the adjacent, closed landfill facility). The northern part of the extension area has already been restore using indigenous materials and is currently utilised for agricultural purposes. The area to the south of the flooded section of the site also been partial restored to calcareous grassland and woodland habitats using indigenous materials.

1.2.14 A summary of surrounding land uses, features, classifications and receptors is included within **Table ESSD1**.

Table ESSD1: Local land uses, features, classifications and receptors and their relevant distances from the site (within 500m)

ID	Receptor Name	Type of Receptor	Approximate nearest distance from the operational boundary	Direction from the operational areas
R1	Principle Aquifer (Magnesian Limestone)	Groundwater	Underlying	N/A
R2	Doncaster Lane	Public Highway	Adjacent	North
R3	Straight Lane	Public Highway	Adjacent	West
R4	Public Footpaths / Bridle Ways	Public Right of Way	Adjacent – 500m	East / North-East / West / South
R5	Skelbrooke Village	Residential Properties	15 – 500m	North / North-East
R6	Agricultural Land	Agricultural	10-500m	North / East / South / West
R7	Bannister Lane	Public Highway	50m	North
R8	Spring	Spring	290m	East
R9	Stream (Tributary of The Skell)	Waterway	320m	North-East
R10	Skelbrooke Park	Local Wildlife Site (Woodland - Deciduous)	320m	North-East
R11	The Skell River	River	360m	North
R12	Harry Wood	Local Wildlife Site (Woodland - Deciduous)	440m	South

1.2.15 The waste related restoration operations will be restricted to the flooded part of Skelbrooke Quarry Extension Area, as illustrated in **Drawing No. WR7640/10/ESSD4**. For the duration of waste operations, the existing perimeter security fencing will be maintained.

Topography

1.2.16 The Skelbrooke Quarry Extension Area is located in an area of gently undulating agricultural land, with surface elevations dropping from approximately 40mAOD at the site's entrance onto Straight Lane, to approximately 30m AOD along the site's eastern boundary. To the north and east of the site ground level falls to elevations of between 25 and 30mAOD, at the River Skell. To the south of the site the ground falls away to levels of around 15mAOD at the Hampole Dike.

Compliance with the EA Approach to Managing and Protecting Groundwater

1.2.17 The waste operations proposed to be operated at Skelbrooke Quarry Extension Area constitutes a non-landfill waste operation that involves the permanent deposits of waste. This activity is therefore considered against Position Statement F1 of the EA approach to the managing and protecting groundwater.

1.2.18 The development site is not located within a Source Protection Zone 1 (SPZ1) and therefore it accords with the decision framework for Position Statement F1 under "The Environment Agency's Approach to Groundwater Protection" (v1.; Nov 2017). Nonetheless, as the quarry void is situated sub-water table within a Principle aquifer that contributes to the baseflow of the River Skell, this triggers the requirement for a Hydrogeological Risk Assessment (HRA) (refer to *Doc. Ref.: WR7640/06.R1).*

2.0 SOURCE

2.1 Site Development

Sources of Information

2.1.1 The baseline of this report has been determined from a review of available published information, including:

- BGS 1:50,000 scale geology maps
- Environment Agency web-based data
- Data.gov.uk website
- DEFRA's MAGIC website

2.2 Historical Development

Historical Use of Land

2.2.1 A review of historical maps for the site and surrounding areas, indicate that during the nineteenth century, the site was undeveloped and largely rural in nature. At this time the surrounding area was generally sparsely populated with some residential properties, a church and a hall located in Skelbrooke village to the northeast of the site. Straight Lane and Doncaster Lane to the north and east of the site respectively are denoted upon maps dating back to the mid 1800's. By 1906, the South Yorkshire Junction Railway was depicted to the south/west, occupying the area of land now utilised as the site access road.

2.2.2 The site area comprised undeveloped, rural land at the turn of the twentieth century. The 1:2,500 scale map dated 1932 denotes a "Tarmacadam Works" and "Quarry" to the immediate south of the extension site. These works were associated with the development of the wider Skelbrooke Quarry complex operations. The 1:10,650 scale map dated 1948 depicted an additional quarry, beyond Doncaster Road to the south/east of the site.

2.2.3 Over the course of the second half of the twentieth century, the village of Skelbrooke increased in size, with the addition of residential properties, recreational grounds, parks and farms.

2.2.4 Messrs J. Hinchcliffe & Son Ltd developed quarry operations prior to the mid-1970's. Darrington Quarries Ltd has operated the site since 1976 (Darrington Quarries became part of Waste Recycling Group plc in 1998). During the 1980's quarrying operations on the wider Skelbrooke quarry complex began to expand in a westerly direction, beyond the aforementioned railway line. The 1:10,000 scale map dated 1983 depicts the railway as being "dismantled". The quarry is also clearly identified as being a limestone quarry. The quarrying operations are depicted to the west and south over the site throughout the 1990's. No other operations occurred within the area of Skelbrooke Quarry prior to the development of the quarry. It is understood that quarry operations included the coating of aggregates with bitumen, and possibly tar, to create coated roadstone.

2.2.5 Landfilling subsequently commenced at the main site in 1992 with the development of Phase 1. Landfilling within Phase 1 was completed in June 1993 and the cell was capped off in August 1993. Subsequent landfill cells 2 - 5 were developed, filled and capped between June 1993 and October 2001. Tipping operations were suspended between August 1995 and October 1996, and again

between November 1998 and July 1999. Landfill operations within the final cell (cell 6) commenced in August 2001 and ceased in 2005.

2.2.6 From analysis of available mapping imagery, it can be seen that the southern part of the extension site itself was utilised to support the adjacent landfilling operations during the early 2000's, which regenerated to grassland over time. The central area was previously excavated as part of the adjacent quarrying operations and the void subsequently flooded. The northern extent of the extension site remains undeveloped and has been utilised for agricultural purposes for last 15 years or so. The wider Skelbrooke Quarry complex has undergone a phased approach to restoration, with imagery depicting that the site was fully restored by 2019, however the site access road remains to be on site.

Other Relevant Land Uses

2.2.7 There are no other relevant land uses which may have given rise to potential sources of non-waste related contamination at the extension site.

Incidents

2.2.8 There are no environmental incidents that require discussion.

2.3 Proposed Development

2.3.1 The proposed development is for the infilling of non-hazardous materials with low pollution potential derived from low contamination risk sources into the flooded part of the site as an alternative scheme of restoration. This will be conducted principally to address safety concerns associated with the flooded part of the site. The revised scheme of restoration seeks to re-establish the site to a low-level profile that will bring the ground levels within the flooded section above that of water levels within the void.

2.3.2 The infilling/restoration of the extension area will require the deposit of material below the water table, which currently ranges between 24.3 and 31mAOD (range of groundwater levels recorded in groundwater monitoring borehole SK02), compared to the void basal levels of between 16 and 20 mAOD. To achieve the restoration scheme, c. 230,000 m^3 of non-hazardous material will be deposited over an anticipated period of between one and three years, subject to material availability. Approximately 6,000m^3 of this volume will be site-won.

2.3.3 Whilst quarrying within the extension area and landfilling within the adjacent landfill was supported by the management of groundwaters emerging from the sidewalls of the site, groundwater has since been allowed to rebound to natural levels. The main landfill facility is designed and operated under the principles of hydraulic containment, in which leachate levels within each cell are managed at a level that is 1m below the minimum recorded groundwater levels within the Brotherton Formation in order to maintain hydraulic containment conditions. Drawdown estimates present in **Appendix ESSD6** indicates that there is some potential that dewatering of the flooded void of the extension area could reduce groundwater levels along the northern edge of the Cells 1 and 6 and therefore potentially impact upon hydraulic containment conditions along the edges of these cells. The estimated zone of radius from dewatering the quarry void could draw in contaminated groundwaters leaking from the neighbouring restored Doncaster MBC Landfill, which was designed to operate under the principles of dilute and disperse. As a result, further issues could be raised regarding the discharge of abstracted groundwaters from the site.

2.3.4 Dewatering of the extension area would also necessitate the construction of a temporary surface water attenuation lagoon to support the continued management of surface water run-off from the restored main landfill site. Dewatering of the void would require an estimated abstraction at between ~250 – ~2,200 m^3/d **(see Appendix ESSD6)** based on the permeability ranges from rising head tests in various boreholes at Skelbrooke (~0.01 - ~130m/d) and published ranges from Magnesian Limestone (~2.5 - ~10m/d)).

2.3.5 DQL therefore propose to directly tip suitable fill material with a pollution potential of less than, or equal to, the natural quality of the surrounding geology/groundwater into the flooded void to raise ground levels to raise levels above representative maximum groundwater levels within the surrounding aquifer (i.e. ~28.2m AOD in SK02) and enable surface water to discharge from the site under gravity to the tributary to The Skell River that is located immediately beyond the north-eastern edge of the void. The restoration proposals will also incorporate a wetland habitat that will provide long-term flood attenuation of surface water run-off from the capped and restored main landfill facility, as indicatively shown in **Drawing No. WR7640/10/ESSD5.**

2.3.6 Note the revised scheme of restoration will not change the current ground levels to the northwest and southeast quarry extension area, which are also incorporated in the permit boundary of Environmental Permit EPR/CP39994ZR.

Proposed Waste Types

2.3.1 The primary source of material to be deposited are non-hazardous materials consisting of soils and other wastes with a low pollution potential, including uncontaminated quarry wastes, soils from local greenfield or low-risk brownfield development sites, and other wastes with a low contamination potential, including construction product manufacturing, construction, demolition and excavation waste products. The waste will not have undergone significant physical, chemical and / or biological transformation. A full list of wastes is present in **Appendix ESSD1**. Site specific waste acceptance criteria and procedures have been derived for other wastes that may be accepted at the site. Appropriate criteria has been derived based on the dilution available within the flooded quarry void and surrounding limestone aquifer, and baseline groundwater quality. The waste materials will be suitable for their intended purpose from a chemical, physical and biological perspective, which will be appropriately characterised and verified prior to deposit at the site.

2.3.2 The upper limits to the leachable and pollutant content of the proposed wastes are determined by a ratio of 10 litres of distilled water to 1 kg of waste, with the result quoted as concentration per unit of mass i.e. mg/kg. The WAC leachable limits for the proposed waste and their equivalent concentration per liquid volume are presented in **Table ESSD2.** These concentrations are considered to be representative of a worst-case leachate source term for the waste recovery operation. These thresholds have been derived based on a review of dilution factors and baseline groundwater quality associated with the Magnesian Limestone within which the wastes will be deposited.

Table ESSD2: Proposed WAC and Equivalent Infill Material Liquid Concentration

Parameter	Proposed Waste Acceptance Criteria (L/S 10:1 mg/kg)	Worst-Case Pollution Concentration (mg/l)
Arsenic	1.5	0.15
Cadmium	0.12	0.012
Chromium	1.5	0.15
Copper	6	0.6
Nickel	1.2	0.12
Lead	0.5	0.05
Mercury	0.03	0.003
Nickel	1.2	0.12
Phenol	3	0.3
Zinc	12	1.2
Chloride	2,400	240
Fluoride	30	3
Sulphate	3,000	300

Phasing

2.3.3 There will be no phasing at the extension area. Waste will be tipped from the edge into the water-filled void until final levels illustrated in **Drawing No. WR7640/10/ESSD5** are achieved.

Hydrogeological Risk Screening

2.3.4 Schedule 22 from The Environmental Permitting (England and Wales) Regulations 2016 covers all aspects in relation to groundwater activities. The regulations provide a consolidated system of environmental permitting relating to the relevant functions, granting of an environmental permit as well as the groundwater activities for which a permit may be granted.

2.3.5 The waste operations at Skelbrooke Quarry Extension areas constitute a Groundwater Activity under Schedule 22 of EPR2016 on the basis that it has the potential to lead to the direct and indirect discharge of pollutants to groundwater. A Hydrogeological Risk Assessment has therefore been prepared in support of the application.

Final Landform and After-Use

2.3.6 The final landform for the restored quarry area is presented in **Drawing No. WR7640/10/ESSD5.** It comprises a low-level platform on which various habitats will be developed, including wetland, and calcareous grassland and woodland habitats. The final restored levels tie in with those of the surrounding land which will also support long-term surface water management requirements for the site and wider Skelbrooke Quarry complex.

3.0 PATHWAY AND RECEPTOR

3.1 Climate

3.1.1 Regional climate data has been sourced from the recording station located at Church Fenton (Leeds East Airport), which is located approximately 26km to the north of Skelbrooke.

3.1.2 Average monthly and annual rainfall depths and rainfall days for Church Fenton are presented in **Table ESSD3**. The average annual mean rainfall for this area is 603.2mm. The average potential evaporation totals for MORECS square 99[1], which includes Skelbrooke Quarry Extension Area, are between approximately 530 – 600 mm/yr[2].

Table ESSD3: Average Rainfall and days of rainfall (>1mm) at Church Fenton (1981-2010)

Month	Rainfall (mm)	Days of rainfall >= 1 mm (days)
Jan	50.3	10.8
Feb	37.3	8.5
Mar	45.5	9.9
Apr	46.3	9
May	42.6	8.9
Jun	54.8	8.9
Jul	50.2	8.6
Aug	57.9	9.4
Sep	51.2	8.3
Oct	56.7	10.1
Nov	53.9	11
Dec	56.6	10.6
Annual	603.2	114

Source: www.metoffice.gov.uk

3.1.3 Incident rainfall onto the Upper Magnesian Limestone will form a greater proportion of groundwater recharge than that falling onto the Upper and Middle Permian Marls. The Marls comprise low permeability mudstone and clay horizons which will ensure that rainfall will preferentially form surface water and run off.

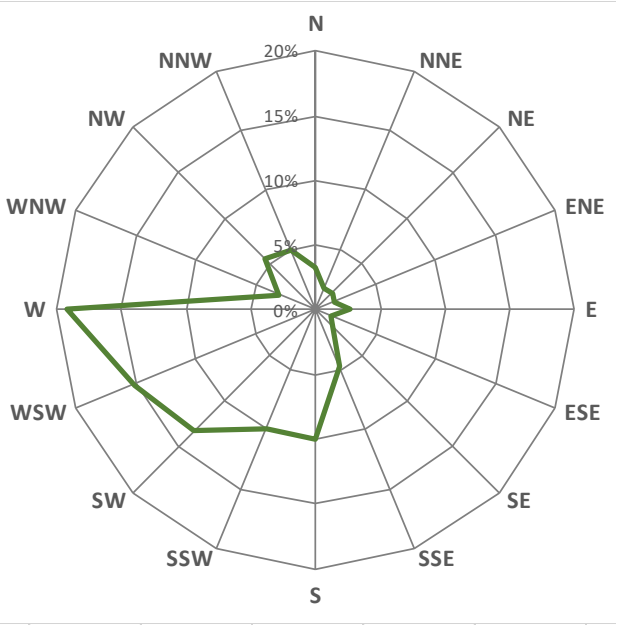
3.1.4 The predominant local wind direction is from the western quadrant with the prevailing with significant contributions from the west-southwest / south-west, as seen in **Figure ESSD1**. Wind from the north-western quarter occurring relatively less frequently, with winds from the south-eastern and north-eastern, occurring very infrequently. Wind speeds remain below 5m/s for 65.44% of the time. Monthly wind speed averages throughout the year range from 3.8m/s to 5.27m/s.

[1] Hough, M. N. & Jones, R. J. A (1997) The United Kingdom Meteorological Office rainfall and evaporation calculation system: MORECS version 2.0 – an overview. Hydrology and Earth System Sciences, 1(2), pp. 227 – 239.

[2] Kay, A. L., Bell, V. A., Blyth, E. m>, Crooks, S. M., Davies, H. N. & Reynard, N. S. (2013) A hydrological perspective on evaporation: historical trends and future projections in Britain. Journal of Water and Climate Change, 04.3, pp. 193 – 208.

Figure ESSD1: Wind direction data and wind rose for Church Fenton meteorological recording station between 2000 - 2010 (inclusive)

Direction	Percentage
N	3.22%
NNE	1.77%
NE	1.80%
ENE	1.59%
E	2.59%
ESE	1.21%
SE	1.90%
SSE	4.71%
S	10.01%
SSW	10.02%
SW	13.24%
WSW	15.17%
W	19.17%
WNW	3.10%
NW	5.50%
NNW	5%



(Source: RenSMART)

3.2 Geology

3.2.1 The geology of Skelbrooke Quarry Extension Area is taken from:

- British Geological Survey 1:50,000, Sheet No. 87 Barnsley Solid and Drift (1976).
- British Geological Survey 1:50,000, Sheet No. 78 Wakefield Solid and Drift (1978).
- British Geological Survey 1: 63,360, Sheet No. 88 Doncaster Solid and Drift (1969).
- British Geological Survey 1:63,360, Sheet No. 79 Goole Solid and Drift (l971).
- Institute of Geological Sciences 1:100,000 Hydrogeological Map of Southern Yorkshire and Adjoining Areas (1982).
- National Rivers Authority (now the Environment Agency), Policy and Practice for the
- Protection of Groundwater - Regional Appendix Yorkshire Region. 1991.

3.2.2 These data have been supplemented by site specific information, details of which include:

- Logs of fifteen boreholes advanced in 1991 within the extension area as part of a mineral evaluation exercise.
- Logs of three boreholes (SB Series) advanced by SECOR (now SLR) in March 1998 to further characterise the nature of the deposits in the extension area and provide permanent groundwater monitoring installations.

3.2.3 Borehole logs from both these investigations are shown in **Appendices ESSD2** and **ESSD3** respectively.

3.2.4 In terms of superficial despots, the British Geological Society indicates that there are only limited deposits at the site, whereby the central area of the site is underlain by Till, Mid Pleistocene – Diamicton and Lacustrine deposits of clay and silt. The till was formed up to 2 million years ago, during the quaternary period where the local environment previously dominated by ice age conditions. The Lacustrine deposits were formed up to 3 million years ago in the Quaternary period where the local environment was previously dominated by lakes.

3.2.5 In terms of bedrock geology, the site lies on the western margin of the Vale of York and has been developed in the Permian Magnesian Limestone formation which, in Yorkshire, comprises two dolomitic limestones separated by a horizon of marl. Regionally, Carboniferous Coal Measures lie to the west of the site, while younger Triassic Sherwood Sandstone lies to the east (**Drawing No. WR7640/10/ESSD6**). A remnant of in-situ limestone remains between the main landfill area and the extension area, along the length of the site access road, as this area has remained unworked due to it previously being the route of a railway line. Further detail is given in **Table ESSD4**.

Table ESSD4: Geological units present at Skelbrooke Landfill and Quarry Extension Area Complex

Unit	Typical Thickness at Landfill (m)	Description
Upper Permian Marl (Roxby Formation)	6	Red shaley clays and mudstones with gypsum and anhydrite seams
Upper Magnesian Limestone (Brotherton Formation)	20	Compact and flaggy dolomitic limestone with thin beds of mudstone
Middle Marl (Edlington Formation)	35	Red brown and grey green mudstone with interbedded sulphates (gypsum and, at depth, anhydrite)
Lower Magnesian Limestone (Cadeby Formation)	N/A	Composed of two lithological groups. The upper division contains minutely cellular and highly porous dolomite, characterised at or near surface by solutional features. The lower division comprises regularly bedded dolomitic and oolitic limestones.
Basal Permian Sands and Breccia	N/A	Outcrops as a discontinuous layer of loosely cemented sand succession, resting unconformably on the Carboniferous rocks.

3.2.6 The Permian sediments dip gently, approximately 2°, to the east. **Drawing No. WR7640/10/ESSD6** indicates that regionally there are a series of south-west/north-east trending faults in the vicinity of the site. Skelbrooke Quarry Extension Area and Landfill complex is fault bounded to the north-west and south-east:

3.2.7 The north-western fault is shown to impinge on the northern boundary of the main Skelbrooke Landfill site and to have down thrown to the south-east. The magnitude of the downthrow is not known. Geological mapping conducted at the site has shown the fault plane to comprise of 2m of clay fill. Upper Permian Marl is known to outcrop in the northern margin of the site.

3.2.8 The south-eastern fault abuts the south of the adjacent main Skelbrooke Landfill site, although it is some distance from the eastern extension, and is shown to have downthrown to the north-west. The magnitude of the downthrow is not known. The Middle Permian Marl is shown to outcrop at surface immediately to the south and west of the site.

3.2.9 To the west of site are the Pennine Upper Coal Measures Strata (outcrop at South Emersal) continuing to the west to Grimethorpe, beyond which are the Pennine Middle Coal Measures. To the east of site are the stratigraphically higher Permo-Triassic strata.

3.2.10 Site investigations and geological mapping of the features afforded by the quarry excavations at Skelbrooke concur with the published information. In particular:

- The Upper Marl (Roxby Formation), present at surface in the north of the adjacent main Skelbrooke Landfill as well as Quarry Extension Area, is recorded to comprise of soft to firm grey and brown clay. A maximum
  thickness, of 6m, was recorded in borehole SB98-I.
- The Upper Magnesian Limestone (Brotherton Formation) is a competent fine-grained pale grey to buff limestone. Within the extension area geological mapping indicates that the base of the Upper Magnesian Limestone falls from 24mAOD to 10mAOD from west to east across the extension area. This is shown as **Drawing No. WR7640/10/ESSD6**, which depicts the boundary of the Upper Magnesian Limestone and the Middle Permian Marl.
- The Middle Marl (Edlington Formation) comprises grey to white and rich brown mudstones. Site investigations, carried out in the presence of the Environment Agency, have proven the thickness of the Middle Marl to be 35m.
- Mapping indicates that relatively simple regional geological structure is complicated at the local scale. Features mapped during the quarry excavation show a minor syncline in the north of the adjacent Quarry Extension Area/main Skelbrooke Landfill site and a minor anticline in the south of the extension area. Both features have a south west-north east orientation.

3.2.11 The base of the proposed Skelbrooke Quarry Extension Area has been developed on in-situ Middle Permian Marl. The base of the void, across the whole quarry extension area is below the Upper Magnesian Limestone / Middle Permian Marl interface.

3.2.12 The geological map (see **Drawing No. WR7640/10/ESSD6**) indicates that the former Doncaster Metropolitan Borough Council Landfill, to the east of the extension area, was also developed within an outcrop of Upper Magnesian Limestone.

3.3 Hydrology

3.3.1 The hydrology of the site is taken from Ordnance Survey topographical maps, water quality monitoring undertaken in the vicinity of the application site, information provided by the Environment Agency's 'Catchment Data Explorer' and information provided by FCC Environment regarding their surface water management scheme at the adjacent main Skelbrooke landfill.

3.3.2 The main watercourse within the vicinity of the site is the River Skell, which is located approximately 360m to the north. This water course flows in a generally easterly direction. A small tributary of the River Skell rises, via a number of springs, immediately to the north east of the site. The closest of these springs lies ~290m east of the quarry extension area.

3.3.3 Surface water run-off the adjacent capped landfill site is collected via network of collection ditches around its periphery and across the capped surface and is currently discharged into the flooded void of the extension area. It then soaks away into the surrounding limestone aquifer.

3.3.4 The site originally benefited from a discharge consent that allowed the discharge of surface water from the site via a land drain located along the north-eastern boundary of the extension area, in which the volumes and rate of discharge were limited to 200m³/day and 20m³/hr respectively. This consent was subsequently incorporated into Environmental Permit EPR/BV1470IE and currently authorises the discharge of water collected within the site's surface water management system; consisting of precipitation falling on the capped surface of the main Skelbrooke Landfill Site. There are no flow related limits specified in the current permit.

3.3.5 The Environment Agency does not maintain records of river flows within the vicinity of Skelbrooke extension site. Notwithstanding this, as part of the ESID report prepared 2003 in support of the application for a PPC Permit for the adjacent landfilling operations, the Environment Agency provided a flow regime summary from the hydrological software for the River Skel tributary at point NGR SE 515 121 which is adjacent to monitoring point SKSW05 , for which summary statistics include:

- Catchment Area – 0.69km^2
- Average annual rainfall – 606mm;
- Average annual potential evaporation – 584mm;
- Average annual runoff 164mm;
- Mean flow – 0.004m^3/sec; and
- Q95 – 0.001 m³/sec

3.3.6 Flooded section of the extension area which occupies an area of approximately 2.56Ha.

Discharge Consents

3.3.7 There are currently 3 licensed discharges to water and groundwater within 1km of the site. Summary details are provided in **Table ESSD5.**

Table ESSD5: Summary of active Discharge Consents to water and groundwater within 1km of the site

Location	Details
Skelbrooke, Skelbrooke Quarry, Straight Lane, Doncaster, UK Distance: 02.km west NGR: 451110, 411720	Permit Number: NE/WRA7479/01 Permit Holder Name: Darrington Quarries Limited Start Date: 15/12/1998 Site Name: Skelbrooke Quarry Site Type: Undefined or Other Local Authority: Doncaster
Skelbrooke, Skelbrooke Hall, Skelbrooke Carcroft, Doncaster, South Yorkshire, DN6 8LU Distance: 0.4km NE NGR: 451131, 412277	Permit Number: NE/S/P/545/001 Permit Holder Name: Skelbrooke Hall Start Date: 30/031963 Site Name: Skelbrooke Hall Site Type: Undefined or Other Local Authority: Doncaster
Whitegates, Whitegates, Bannister Lane, Skelbrooke, near Doncaster, South Yorkshire, DN6 8LU Distance: 0.8km NE NGR: 451500, 412500	Permit Number: NE/2400/001 Permit Holder Name Whitegates Start Date:09/07/1968 Site Name: Whitegates Site Type: Undefined or Other Local Authority: Doncaster

Surface Water Quality

3.3.8 Based on the information presented on the Environment Agency website under the Water Framework Directive classification the ecological quality of the Skell from the source to the Frickley Beck is currently 'moderate', whilst chemical quality is currently 'good'.

3.3.9 DQL have undertaken monthly and quarterly monitoring programmes for surface water quality in line with the Environmental Permit at the adjacent main Skelbrooke Landfill site. In June 2011 FCC also carried out a review of surface water monitoring points which have been used to assess the external surface water quality in order to determine the effect of the site. The report assessed sample points associated with the off-site surface water features (SKSW04, SKSW05 and SKSW06), sample points associated with the backwall drainage system (SKSW01, SKSW02, SKSW03 and SKDRAIN) and a sample point associated with run-off from the capped landfill (SKLAGOON). Overall, the report concluded that there is no direct link between the on-site and off-site surface water systems. Additionally, it was found that these points are likely to be affected by run off from surrounding arable farmland and possibly the nearby unlined old Doncaster MBC Landfill, particularly in relation to an underlying flow of ammoniacal nitrogen throughout the area.

3.3.10 A review of the Hydrogeological Risk Assessment was prepared for the adjacent main Skelbrooke Landfill Site in 2019. It indicated that the monitoring points SKSW01-03 are all in the back-wall drain system behind the engineered side-wall liner, and as such are not exposed to surface water and are purely fed by groundwater seepage at the interface between the Magnesian Limestone and the Marl.

3.3.11 During the 2019 HRAR, analysis was conducted of the monitoring points that are not associated with the back-wall drain. It was found that SKSW05 had consistently high concentrations of ammoniacal nitrogen and mecoprop (when anomalous results were excluded). SKSW05 is located at a spring down-gradient of the main site, and therefore unconnected to SKSW04 which is located closer to the main site, but in a surface water ditch. As the groundwater monitoring boreholes down-gradient of the site do not show the same high concentrations as SKSW05, it can be concluded that the source of the high ammoniacal nitrogen and mecoprop concentration were due to a source other than the landfill. Historic correspondence between the Environment Agency and

Doncaster MBC presented in **Appendix ESSD7** indicates that the dilute and disperse landfill located adjacent to the Skelbrooke complex has been previously identified as source of pollution to the Skell A summary of the surface water monitoring statistics are shown in **Table ESSD6**.

Table ESSD6: Surface Water Quality (mg/l) between 2013 and 2019

2013-2019		NH4-N	Cl	Ca	Mg	Na	K	SO_4	Alk	TOC
SKLAGOON	Av.	0.2	62	136	64	185	9	366	195	6
	Max	2.1	73	156	70	3960	14	405	332	8
SKSW04 (discharge to River Skell)	Av.	0.1	57	169	63	32	9	246	334	7
	Max	0.2	201	293	94	59	16	366	507	10
SKSW05 (spring)	Av.	4.3	82	165	75	71	13	187	481	7
	Max	16.8	138	238	96	447	26	363	773	9

3.3.12 The adjacent main landfill is now closed, but one of the remaining appropriate surface water monitoring points is 'SKLAGOON' which is where the back-wall drain from the main site previously discharged to (if pumped) in addition to surface water draining off the adjacent site. This monitoring point lies within the extension area's flooded void.

Flood Risk

3.3.13 In terms of Flood Risk, upon review of the Environment Agency data, it can be confirmed that the site does not lie within any recognised floodplains and associated flood zones. The area is classed as having a low probability of flooding from rivers and the sea i.e. less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year.

3.3.14 Surface and ground waters within the quarry are appropriately managed within the confines of the former quarry and landfill complex.

3.4 Hydrogeology

3.4.1 The hydrogeology of the application site is taken from the results of groundwater monitoring undertaken by FCC around the periphery of the adjacent main landfill site, the British Geological Survey (formerly the Institute of Geological Sciences) and the former Anglian Water Authority 1:125,000 scale hydrogeological map of southern East Anglia, information provided by the Environment Agency, and historical groundwater level and groundwater quality monitoring undertaken by Darlington Quarries Limited and FCC in the vicinity of the application site.

3.4.2 Groundwater is contained within the Upper Magnesian Limestone that remains around the perimeter of the site. Groundwater flow is predominantly associated with fissure flow, with intergranular porosity being relatively low. This may be attributed to the extensive dolomotisation of the strata.

Source Protection Zones

3.4.3 The closest Source Protection Zone (zone 3) is located c. 7.3km to the southeast, around Thorpe Marsh Nature Reserve, with the closest Zone 1 SPZ is located *c*. 9.4km to the north, near Stapleton, to the east of Pontefract.

Aquifer Physical Characteristics

3.4.4 The site is located within the Permian Magnesian Limestone Formation. A summary of the aquifer characteristics, for the major formations found in the vicinity of the site are shown in **Table ESSD7** below. Environment Agency aquifer classifications are also shown.

Table ESSD7: Geological Units Present at Skelbrooke Quarry Extension Area

Formation	Aquifer Characteristics
Upper Permian Marl (Roxby Formation)	Acts as an aquitard separating groundwater in the younger Sherwood Sandstone from that of the Upper Magnesian Limestone. Intergranular flow dominates. EA Classification: Unproductive
Upper Magnesian Limestone (Brotherton Formation)	Groundwater flow is concentrated along bedding planes intersected by fissures and joints. Springs discharge along its junction with adjacent "marls". Localised faulting, fissuring and karstic conditions can provide large borehole yields. Secondary permeability greater than primary and hence fissure flow predominates EA Classification: Principal Aquifer
Middle Marl (Edlington Formation)	Functions as an aquiclude between the Upper and Lower Magnesian Limestones. Intergranular flow. EA Classification: Unproductive

3.4.5 The Upper Permian Marl (Roxby Formation) acts as an aquitard separating groundwater in the younger Sherwood Sandstone from that of the Upper Magnesian Limestone and is classified by the Environment Agency as Unproductive. The EA indicate that these are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

3.4.6 The Upper Magnesian Limestone (Brotherton Formation) is classified as a Principle aquifer in which groundwater flow is concentrated along bedding planes intersected by fissures and joints. Springs discharge along the junction of this formation with adjacent marls. The Environment Agency describe a Principle Aquifer as layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifers.

3.4.7 The Middle Marl (Edlington Formation) is classified as Unproductive (as with the Upper Permian Marl) and acts as an aquiclude between the Upper and Lower Magnesian Limestones.

3.4.8 Laboratory measurements conducted on Magnesian Limestone indicate an average porosity of 15-20% and intergranular permeability ranging from 10-4 to 1 m/d. Pumping tests indicate an average transmissivity of around 300m²/d with local transmissivities as high as 1500m²/d.

3.4.9 Studies carried out elsewhere, by the Environment Agency, on the Lower Magnesian Limestone indicate:

- Pumping tests carried out within the Magnesian Limestone have determined transmissivities ranging from 45 to 4360 m/d, with hydraulic conductivities varying from 6 to 110 m/d.
- The Lower Magnesian Limestone rock has a bulk hydraulic conductivity of approximately 10 m/d at the macroscopic scale (i.e. the scale of the quarry).

3.4.10 A plan of the hydrogeological site setting is presented as **Drawing No. WR7640/05/ESSD7**. The plan depicts Hampole Dike, which flows eastward 500m south of the site as a perennial stream (a stream which flows all year

round) which is probably in continuity with groundwater in the Magnesian Limestone. The River Skell, to the north of the site, is also shown.

3.4.11 The Environment Agency (Policy and Practice for the Protection of Groundwater) recognise that the Middle Permian Marl possesses a negligible permeability and acts a barrier to vertical groundwater movement between the more permeable Upper and Lower Magnesian Limestone units. Accordingly, the Agency has designated the Marl as unproductive strata.

3.4.12 The superficial sediments in the area (where present) are classified as a Secondary Undifferentiated Aquifer. Secondary undifferentiated are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. There are no superficial receptors at site.

Licensed Abstractions and Private Water Supplies

3.4.13 There are five licensed water abstractions within 2.5km of Skelbrooke Landfill complex; these are shown on **Drawing No. WR7640/10/ESSD7** and summary details below:

- Abstraction licence for surface water from Hampole Dike and/or the River Skell for spray irrigation and general agriculture uses. The permitted yield is 4,546m^3/annum.
- Permits the abstraction of groundwater from the Magnesian Limestone (unit unspecified) at Summerhouse Farm. The licence permits a yield of 1,440m^3 for general agriculture, farming and domestic uses.
- Allows DQL to abstract 9m^3/annum of groundwater for general industrial purposes.
- Permits the abstraction of surface water from the River Skell. The licensed yield is 109m^3/annum.
- Permits the abstraction of groundwater from the Magnesian Limestone (unit unspecified). The licensed yield is 109m3/annum.
- Allows the abstraction of groundwater from the Coal Measures. The permitted yield is 10,000m^3/annum.

3.4.14 City of Wakefield Metropolitan District Council maintain records of two unlicensed private water supplies within 2km of the main Skelbrooke Landfill complex. Both entries are located to the east of the site at Cherry Tree Farm (as well as adjacent bungalow) and dwellings at Bellvedere and Drimnatorrin. These are shown on **Drawing No. WR7640/10/ESSD7.**

Groundwater Flow

3.4.15 Within the area of the site, it is anticipated that groundwater would have naturally flowed towards the Skelbrooke Springs, located to the north-east of the site. The closest, which lies *c.* 320m from the site, rises at 23maOD and forms a tributary of the River Skell.

3.4.16 Groundwater levels between the main landfill and the extension area are monitored in three monitoring boreholes (SK01, SK02 and SK03). A statistical summary of the groundwater levels recorded within each borehole between 1996-2019 are presented in **Table ESSD8**. Data analysis carried out on the groundwater level data from 1996 – 2019 is presented in **Appendix ESSD4**.

Table ESSD8: Statistical summary of monitored groundwater levels along the north-eastern edge of Skelbrooke Landfill Site

Statistic	SK01	SK02	SK03	SK04	SK05
Min	21.83	24.27	26.68	30.42	31.36
Mean	24.20	26.47	27.95	32.95	34.40
Median	23.28	26.42	27.91	32.90	34.25
Max	29.98	31.05	29.70	34.70	37.43

3.4.17 Groundwater levels along the north-eastern edge of the main landfill are at their lowest at the northern edge (SK01) of this boundary and highest (SK05) at the southern edge.

3.4.18 In addition to the above, data collected between 1991 and 1998 indicates that there is a localised cone of depression in the groundwater, which corresponds with a localised depression in the structure of the limestone and Middle Permian Marl in the extension area, and that hydraulic gradients to the north/north west of the extension area may have been locally reversed and those to the south increased as a result. All data indicates that the groundwater in the vicinity of the site is in hydraulic continuity with the Skelbrooke Spring which is located 320 metres north-east of the site.

3.4.19 It is considered that any groundwater in the Middle Permian Marl is permanently unsuitable for other uses, especially domestic and agriculture. Review of aquifer characteristics has shown that the Middle Permian Marl cannot provide reliable yields even to small groundwater abstractions.

Groundwater Quality

Regional Groundwater Quality

3.4.20 The regional groundwater quality is of medium to high vulnerability owing to soluble rock risk.

3.4.21 The baseline groundwater quality for Magnesian Limestone (of County Durham and North Yorkshire) reported by the British Geological Survey (2009) has been summarised in **Table ESSD9**.

Table ESSD9: Statistical summary of regional groundwater quality data for Magnesian Limestone (County Durham and North Yorkshire) (BGS, 2009)

Parameter	Units	n	n (c)	Min	Mean	Max	P5	P25	P50	P75	P90	P95
pH		39	0	6.93	7.3	8.22	6.95	7.14	7.24	7.38	7.50	7.60
Ca	mg/l	107	0	10.3	109	547	57.8	74.9	92.0	117	165	177
Mg	mg/l	107	0	0.519	49.5	537	25.7	35.0	42.8	50.0	73.0	84.0
Na	mg/l	106	0	8.45	80.4	4610	12.4	20.5	27.5	40.1	78.4	125
K	mg/l	107	0	0.613	5.18	196	1.48	2.20	2.82	3.94	7.17	9.60
Cl	mg/l	109	1	<2	138	9250	14.8	23.1	38.3	53.8	111	235
SO_4	mg/l	107	0	1.18	160	1610	21.8	49.5	89.1	153	400	461
HCO_3	mg/l	110	0	56	357	586	240	311	351	397	497	504
Si	mg/l	36	0	1.5	4.18	6.56	2.63	3.43	4.01	4.90	5.80	6.33
Ag	µg/l	36	36	<0.05		<0.05						
Al	µg/l	104	83	<0.5	9.17	451	$4.00x10^{-4}$	0.009	0.086	0.758	5.01	27.6
As	µg/l	36	17	<0.05	0.249	2.96			0.05	0.15	0.61	1.46
B	µg/l	102	59	<100	70.2	1320	17.6	31.7	45	69.7	104	161
Ba	µg/l	104	0	8	90.4	939	16.1	34	62	10	160	177
Be	µg/l	36	36	<0.01		<0.01						
Br	mg/l	36	1	<0.02	0.215	1.02	0.048	0.099	0.135	0.182	0.519	0.865
Cd	µg/l	104	87	<0.005		0.193						
Ce	µg/l	36	30	<0.002	0.098	0.008						
Co	µg/l	36	4	<0.005	3.26	1.07		0.009	0.019	0.038	0.415	0.686
Cr	µg/l	103	51	<0.2	0.044	222			0.2	1.39	2.77	4.9
Cs	µg/l	36	0	0.01	1.58	0.262	0.014	0.023	0.031	0.039	0.073	0.22
Cu	µg/l	104	35	<0.5		12.5			0.786	1.34	3.6	5.69
Dy	µg/l	36	36	<0.002		<0.002						
Er	µg/l	36	36	<0.002	0.01	<0.002						

Parameter	Units	n	n (c)	Min	Mean	Max	P5	P25	P50	P75	P90	P95
Eu	µg/l	36	2	<0.002	0.928	0.105		0.004	0.006	0.01	0.015	0.018
F	mg/l	36	0	0.033	444	2.09	0.271	0.409	0.824	1.39	1.57	1.69
Fe	µg/l	109	44	<2		6520			10	247	1560	2200
Ga	µg/l	36	36	<0.005		<0.05						
Gd	µg/l	36	36	<0.002		<0.002						
Ge	µg/l	36	4	<0.01	0.539	5.68		0.04	0.2	0.64	1.33	1.41
Hf	µg/l	36	31	<0.01		0.05						
Ho	µg/l	36	36	<0.002		<0.002						
La	µg/l	36	28	<0.002	0.00115	0.012	$3.01x10^{-5}$	0.000118	0.000348	0.0104	0.0025	0.00425
Li	µg/l	36	0	3.94	34.5	243	7.97	12.5	19.6	33.9	87.6	99.8
Lu	µg/l	36	35	<0.002		0.003						
Mn	µg/l	109	35	<0.005	59.3	1290	0.05	0.28	8.04	58.1	136	270
Mo	µg/l	36	14	<0.2	0.508	2.3			0.3	0.6	1.2	
Nb	µg/l	36	36	<0.05		<0.05						
Nd	µg/l	36	33	<0.004		0.006						
Ni	µg/l	104	93	<0.5		112						
P	µg/l	36	0	2	40.8	866	2	5	7	10	15	343
Pb	µg/l	104	63	<0.01	0.56	45	0.005	0.02	0.059	0.152	0.324	0.48
Pr	µg/l	36	36	<0.002		<0.002						
Rb	µg/l	36	0	0.74	1.94	4.81	1.02	1.31	1.6	2.02	4.18	4.73
Sb	µg/l	36	14	<0.01	0.02	0.11			0.01	0.02	0.05	0.08
Sm	µg/l	36	35	<0.002		0.009						
Sn	µg/l	36	36	<0.5		<0.5						
Sr	µg/l	36	0	78	1230	8330	89	190	593	1640	2620	5650
Ta	µg/l	36	36	<0.05		-0.05						
Tb	µg/l	36	36	<0.002		<0.002						
Th	µg/l	36	35	<0.02		0.031						
Ti	µg/l	36	33	<0.05		0.08						
Tl	µg/l	36	12	<0.01	0.064	0.269			0.017	0.074	0.211	0.253
Tm	µg/l	36	36	<0.002		<0.002						
U	µg/l	36	0	0.021	1.5	3.7	0.118	1.04	1.47	1.75	2.45	2.6
V	µg/l	36	32	<0.1		1.64						
W	µg/l	36	34	<0.1		0.129						
Y	µg/l	36	36	<0.05		<0.05						
Yb	µg/l	36	35	<0.002		0.007						
Zn	µg/l	104	36	<5	21.7	372	1.2	2.6	6.2	19.3	44.6	77.2
Zr	µg/l	36	34	<0.05		0.126						

Note: P = Percentile; n(c) = number censored; min and max are observed values.

Local Groundwater Quality

3.4.22 Darrington Quarries Limited conduct regular groundwater quality sampling. A statistical summary of the groundwater quality at Skelbrooke Landfill site from 1996 to 2021 is detailed in **Table ESSD10** and **Table ESSD11**.

3.4.23 The local groundwater quality (within the vicinity of Skelbrooke Landfill Site) is reportedly often affected by anthropogenic activities, such as the agricultural land uses of the surrounding areas, including fertilizer and mecoprop application. The nearby unlined Doncaster MBC Landfill Site is also likely to have affected groundwater quality in the locality; particularly at Skelbrooke Landfill Site as groundwater pumping may have drawn in the contaminated groundwater from the Doncaster MBC Landfill. Additionally, it is highly likely that other external sources include the natural groundwater dissolution of chloride and sulphate from the Coal Measures and evaporitic sequences associated with the Permian strata.

3.4.24 These outside effects are thought to result in occasional fluctuations and raised concentrations of certain parameters within the local groundwater, such as chloride, sulphur, ammoniacal nitrogen and mecoprop. Previous HRAR's have found that these substances were observed in raised concentrations at the site perimeter groundwater monitoring boreholes, indicating that they were not produced by Skelbrooke Landfill but hailed from other, external sources.

Table ESSD10: Statistical Summary of Upgradient and Cross-Gradient Groundwater Quality at Skelbrooke Landfill Site (Cells 1-6) 1996 – 2021[1,2]

Parameter	Statistic	Upgradient Monitoring Boreholes						Cross-Gradient Monitoring Boreholes			
		SK06	SK07	SK09	SK10	SK11	SK12	SK04	SK05	SK08	SK21
Cadmium (mg/l)	Minimum	0.00003	<0.00002	<0.00002	<0.0001	0.00003	<0.00002	0.00004	0.00004	<0.00002	<0.00002
	Mode	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Mean	0.0003	0.0003	0.0003	0.0004	0.0003	0.0002	0.0003	0.0003	0.0003	0.0003
	Maximum	0.001	0.001	0.0013	0.0021	0.0022	0.0014	0.0012	0.0014	0.0018	0.0014
	St Dev	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003	0.0003
	Count	65	79	78	80	73	58	79	79	76	77
Chloride (mg/l)	Minimum	6	2	13	22	25	21	28	19	26	84
	Mode	28	27	26	33	50	49	38	30	110	120
	Mean	38.6	33	32.7	50.5	55.4	45	45.9	36.2	91	102
	Maximum	219	87	101	123	80	58	84	77	160	140
	St Dev	27.6	13.6	14	18.1	12.4	8.3	11.8	9.6	19	11.4
	Count	157	195	194	194	156	118	193	192	172	172
Chromium (mg/l)	Minimum	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mode	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Mean	0.0035	0.0039	0.0041	0.0044	0.0037	0.0031	0.0041	0.0039	0.0036	0.004
	Maximum	0.0112	0.0241	0.0205	0.0245	0.0214	0.0189	0.0239	0.0162	0.0145	0.0274
	St Dev	0.0025	0.0038	0.004	0.0047	0.0041	0.0035	0.0041	0.0032	0.003	0.0046
	Count	65	80	78	79	73	59	79	79	75	75
Copper (mg/l)	Minimum	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mode	0.005	0.005	0.002	0.005	0.003	0.004	0.003	0.001	0.001	0.001
	Mean	0.0076	0.007	0.0058	0.0065	0.004	0.0047	0.0049	0.0041	0.0035	0.003
	Maximum	0.03	0.03	0.039	0.02	0.009	0.0231	0.02	0.02	0.013	0.009
	St Dev	0.0056	0.005	0.0056	0.0036	0.002	0.0031	0.0041	0.0038	0.003	0.0019
	Count	66	79	77	77	73	59	80	79	75	75
Lead	Minimum	0.0001	0.0001	0.0001	0.0001	0.000037	0.000032	0.000044	<0.00002	0.000039	0.00005

Parameter	Statistic	Upgradient Monitoring Boreholes						Cross-Gradient Monitoring Boreholes			
		SK06	SK07	SK09	SK10	SK11	SK12	SK04	SK05	SK08	SK21
(mg/l)	Mode	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Mean	0.003	0.0032	0.0035	0.0027	0.0028	0.002	0.0034	0.0025	0.003	0.003
	Maximum	0.02	0.043	0.0545	0.033	0.03	0.01	0.05	0.013	0.044	0.03
	St Dev	0.0035	0.0056	0.0072	0.0042	0.0041	0.0018	0.007	0.0026	0.006	0.005
	Count	54	67	65	66	68	58	68	67	68	68
Nickel (mg/l)	Minimum	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0009	0.0009	<0.001	<0.001
	Mode	0.002	0.002	0.001	0.005	0.005	0.001	0.003	0.005	0.001	0.001
	Mean	0.0041	0.0044	0.0036	0.0051	0.0044	0.0034	0.0045	0.0038	0.0033	0.0028
	Maximum	0.018	0.038	0.02	0.025	0.021	0.014	0.014	0.0171	0.025	0.02
	St Dev	0.0028	0.0055	0.004	0.0053	0.0036	0.0025	0.0023	0.003	0.0036	0.0032
	Count	56	71	69	70	68	59	70	69	68	68
Sulphate (mg/l)	Minimum	115	96	238	364	379	260	300	165	197	128
	Mode	238	340	350	440	1380	1040	474	1390	329	200
	Mean	325	291	356	631	997	719	473	1120	293	191
	Maximum	857	669	547	1110	1680	1140	940	2040	462	330
	St Dev	162	127	72	158	368	243	114	381	55	42
	Count	54	69	68	68	66	58	68	68	67	67
Zinc (mg/l)	Minimum	<0.002	0.002	<0.002	<0.002	0.0013	<0.002	<0.002	<0.002	<0.002	0.0013
	Mode	0.002	0.016	0.004	0.006	0.002	0.013	0.003	0.004	0.002	0.002
	Mean	0.016	0.016	0.009	0.011	0.0064	0.015	0.008	0.009	0.0058	0.005
	Maximum	0.16	0.08	0.063	0.062	0.043	0.068	0.049	0.068	0.033	0.021
	St Dev	0.023	0.013	0.01	0.012	0.0072	0.012	0.008	0.01	0.0052	0.0036
	Count	65	78	77	78	72	58	79	77	73	73

[1] - Where concentrations are below the laboratory reporting limit, a value equal to 100% the reporting limit has been used
[2] - Statistical outliers for period removed

Table ESSD11: Statistical Summary of Downgradient Groundwater Quality at Skelbrooke Landfill Site (Cells 1-6) 1996 – 2021

Parameter	Statistic	Downgradient Boreholes		
		SK01	SK02	SK03
Cadmium (mg/l)	Minimum	<0.00002	<0.00002	<0.00002
	Mode	0.0001	0.0001	0.0001
	Mean	0.0002	0.0003	0.0003
	Maximum	0.0011	0.001	0.0029
	St Dev	0.0002	0.0002	0.0004
	Count	49	68	80
Chloride (mg/l)	Minimum	53	51.8	33
	Mode	62	97	44
	Mean	89.9	115.7	45.4
	Maximum	166	378	72
	St Dev	25	54.2	6.9
	Count	102	160	173
Chromium (mg/l)	Minimum	<0.001	<0.001	<0.001
	Mode	0.001	0.001	0.001
	Mean	0.003	0.0036	0.0035
	Maximum	0.01	0.0163	0.0208
	St Dev	0.0025	0.0028	0.0032
	Count	48	67	79
Copper (mg/l)	Minimum	<0.001	<0.001	<0.001
	Mode	0.004	0.005	0.001
	Mean	0.016	0.0044	0.0039
	Maximum	0.138	0.016	0.029
	St Dev	0.00261	0.0026	0.0048
	Count	49	68	79
Lead (mg/l)	Minimum	0.001	0.00036	0.00004
	Mode	0.001	0.001	0.001
	Mean	0.0022	0.0026	0.003
	Maximum	0.016	0.015	0.03
	St Dev	0.0027	0.002	0.005
	Count	47	61	67
Nickel (mg/l)	Minimum	<0.001	<0.0009	<0.0009
	Mode	0.005	0.005	0.005
	Mean	0.006	0.004	0.005
	Maximum	0.017	0.016	0.023
	St Dev	0.004	0.002	0.004
	Count	47	61	70
Sulphate (mg/l)	Minimum	234	285	1270
	Mode	750	426	1600
	Mean	598	457	1558
	Maximum	1400	902	2180
	St Dev	318	109	175
	Count	45	60	67

Parameter	Statistic	Downgradient Boreholes		
		SK01	SK02	SK03
Zinc (mg/l)	Minimum	<0.002	<0.002	<0.002
	Mode	0.01	0.005	0.002
	Mean	0.029	0.01	0.021
	Maximum	0.257	0.08	0.27
	St Dev	0.038	0.0098	0.0418
	Count	89	116	156

[1] -Where concentrations are below the laboratory reporting limit, a value equal to 100% the reporting limit has been used
[2] - Statistical outliers for period removed

3.5 Man-made subsurface pathways

3.5.1 Other than the monitoring boreholes associated with the adjacent main landfill and abstraction boreholes/wells previously discussed, other man-made pathways in the vicinity of the site are likely to include buried utility and service conduits either beneath the local road networks or within neighbouring fields. Specific details of any such conduits have not been identified due to the associated risk with the inert waste deposits.

3.6 Receptors and Compliance Points

3.6.1 Receptors and pathways within close proximity of the site are depicted in **Drawing No. WR7640/10/ESSD9.**

Controlled Waters

3.6.2 Potential receptors of waterborne contaminants from Skelbrooke Quarry Extension Area are:

- Groundwater Resources
- Surface water bodies
- Abstraction points

Groundwater

3.6.3 The groundwater within the Upper Magnesian Limestone forms the primary receptor to potential pollutants that may be released as a consequence of the waste recovery operations. For both hazardous substances and non-hazardous pollutants, the point of compliance will be edge of the site. The Skel river and associated tributaries/springs to the north east constitute the only existing secondary groundwater receptors, although it is feasible that additional abstractions may be permitted from the bedrock limestone aquifer between the site and these springs in the future.

Surface Water

3.6.4 As discussed within the hydrology section, the main watercourses within the vicinity of the site are the River Skell, which is located approximately 750m to the north east and the Hampole Dike, which is located 500m to the south. Both of these water courses flow in a generally easterly direction.

3.6.5 Groundwater within the Upper Magnesian Limestone aquifer discharges via a spring located 290m east of the quarry extension boundary with the adjacent "marls" located approximately 300m east/north of the quarry extension area. As a result of this, a small tributary of the River Skell rises 320m east of the site. Groundwater is also therefore likely to contribute to baseflow to this tributary and ultimately The Skel river.

3.6.6 While direct waste tipping into the void occurs, surface waters from adjacent areas will continue to drain to the site. During and following the final stage of infilling, surface water management will not be carried out. Instead, a wetland area; consisting of a pond, will be established in order to support the attenuation of adjacent site. Additionally, periodic pumping will also be undertaken as required to ensure that no overtopping occurs.

Amenity (Nuisance and Health Issues)

3.6.7 Details of all human, natural and cultural receptors located with 500m of the defined Environmental Permit Boundary are presented in **Table ESSD1.** In summary, the nearest human receptors include users of the public rights of ways located adjacent to the north/eastern boundaries of the extension area as well as those to the south and west of the main landfill site, together with residential properties within 50m of the permit boundary (but >130m from the waste deposition area) located within the village of Skelbrooke to the northeast, users of the adjacent agricultural land and public highways (Doncaster Lane to the east and Straight Lane to the North).

3.6.8 Most of the void is located below the water table which will naturally suppress potential dust emissions form the activities. As waste levels rise above the water table run-off from the adjacent landfill site will continue to be channelled into the void for management pending subsequent discharge. This water will be used to support any dust management requirements at the site until final levels are achieved across the site and vegetation established. As assessed in the Environmental and Accident Risk Assessment *(Doc. Ref.: WR7640/08*), the residual impact to local receptors is considered low to negligible.

3.6.9 Operational activities on the quarry extension area will not result in any significant emissions to air, therefore there is no need to consider any other sites up to a radius of 10km beyond those identified above.

Ecology

3.6.10 There are no RAMSAR sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), Local Nature Reserves or National Nature Reserves (NNRs) located within 2km of the facility. Notwithstanding this, South Elsmall Quarry SSSI, is located *c*. 2.43km to the west, Upton Country Park LNR is located *c*. 2.66km to the North West, Owston Hay Meadows are located *c*. 4.1km to the east and Brockadale SSSI is located *c*. 5km to the North of the site. There are also two Local Wildlife sites located within 500m of the site, these are Skelbrooke Park and Harry Wood

deciduous woodlands. Additionally, there is a non-ecological designation of a Local Geological Site at Hazel Lane Quarry, which lies 850m to the south-west.

3.6.11 The principle emissions that could potentially impact upon these designated habitats are dust. However, as discussed above, the majority of the void is located below the water table which will naturally suppress potential dust emissions from the activities, whilst as waste levels rise above the water table, surface water run-off from the adjacent landfill site will continue to be channelled into the void for management pending subsequent discharge and then used to support dust management operations. As assessed in the Environmental and Accident Risk Assessment *(Doc. Ref.: WR7640/08),* the residual impact to local habitats is considered low.

4.0 POLLUTION CONTROL MEASURES

4.1 Site Engineering

Groundwater Management System

4.1.1 Only wastes in which the maximum allowable leachable concentrations will be adequately diluted within the flooded quarry and surrounding limestone aquifer will be deposited. On this basis there is no requirement to dewater the site. However, it is noted that surface waters from the adjacent restored landfill site will continue to drain into the extension area, which may require abstraction and discharge via the existing consented point of discharge to the tributary to The Skell river located to the northeast of the extension area.

Basal and Side Slope Engineering

4.1.2 Due to the nature of the waste materials to be deposited at the site there is no requirement to enhance the attenuation capacity of the base and sidewalls of void. Nonetheless, the base of the flooded void consists of low permeability marls of the Edlington Formation. This marl has been proven to meet the Landfill Directive requirements for a geological barrier for the adjacent non-hazardous waste landfill facility and will therefore otherwise minimise the downward percolation of any potential pollutants to the Lower Magnesian Limestone.

Capping

4.1.3 There is no requirement to limit the infiltration of waters through the surface of the wastes deposit. No surface capping will therefore be constructed.

Restoration

4.1.4 The restoration scheme agreed under the existing planning consent for the site includes for the establishment of calcareous grassland and woodland habitats across the area to be restored with imported wastes. The planting scheme does not specify the requirement establish an organic rich topsoil horizon at the surface to achieve these habitats. The final metre of deposited waste will comprise suitable soils (originating from the local area) and similar fine material with minimal stone content (stones will be <120mm in size).

Surface Water Management

4.1.5 Surface waters form the surrounding areas, including run-off from the adjacent restored landfill site will continue to discharge in the flooded void of the extension area throughout the operational phase of quarry restoration. Suitable attenuation capacity will continue to be provided at the surface of the waste deposits once they rise above that of the water table. Excess waters will be discharged under the existing consent to a tributary of The Skell.

Post Closure Controls (Aftercare)

4.1.6 Following closure, the site will be restored, and various habitats created. There will be no subsequent aftercare or monitoring requirements owing to the nature of the waste deposited. For example, the potential for gas and leachate production will negligible, therefore, there will be no requirement to monitor or manage gas at the site.

Proposed after-use of the site

4.1.7 Following completion of the infilling activities, the void will be utilised to create wetland and ecological habitats. Following this restoration, the site permit will be surrendered. The wetland habitat created will also provide long-term flood attenuation to support the management of surface waters from the adjacent restored landfill facility.

Post Closure Management of the site

4.1.8 There are proposed post-closure management requirements owing to the low risk nature of the wastes to be deposits. As the soils and stones that will be tipped into the void will be clean and compatible with the locality, the waste is very low risk and will not produce gas. Therefore, there will be no in-waste gas wells installed and monitoring ahead of or post closure will not occur.

Conditions when Permit Surrender is Acceptable

4.1.9 Once the wetland habitat has been established and the site is deemed to be successfully restored, permit surrender will be acceptable. Surrender criteria will be demonstrated by means of waste acceptance records.

5.0 MONITORING

5.1 Gas Monitoring

5.1.1 Only non-degradable non-hazardous wastes will be deposited at the site, for which the potential to produce landfill gas will be negligible. Consequently, it is not proposed to undertake in-waste or perimeter gas monitoring during the active period of infilling of the site. This will also be the case once final levels are achieved in each phase. Waste acceptance procedures will be used to ensure that only non-degradable wastes are deposited at the site.

5.2 Groundwater Monitoring

5.2.1 Groundwater monitoring will be carried out during the active tipping phase of quarry restoration. Monitoring installations currently exist around the periphery of the extension area that are used to support the monitoring schedule specified in the Environment Permit EPR/BV1470IE for the adjacent non-hazardous landfill facility. Those located along the northern and eastern edge of the extension area are current utilised for gas monitoring only but have been assessed to be suitable for groundwater monitoring also. Full details of groundwater monitoring schedules are present in the Hydrogeological Risk Assessment that support the application *(Doc. Ref.: WR7640/06).*

5.3 Surface Water Monitoring

5.3.1 The quality of water with the lagoon will be monitored to determine any significant changes water quality. This monitoring point will continue to be referred to a 'SKLAGOON' as previous adopted for the main landfill site. Full details of surface water monitoring schedules are present in the Hydrogeological Risk Assessment that support the application *(Doc. Ref.: WR7640/06).*

6.0 SITE CONDITION REPORT

6.1 Scope & Objectives

6.1.1 The Site Condition Report assess the baseline environment of the operational areas of Skelbrooke Quarry Extension Area that will not receive permanent deposits of waste.

6.1.2 The Site Condition Report has been compiled in accordance with Environment Agency's Templates: Conceptual Site Model, Environmental Setting and Site Design Report, Version 1, 14/10/2016, and H5 Guidance. Information has been gathered from a number of sources including existing site investigation reports, desk study analysis and observations made by Sirius.

6.1.3 The purpose of this initial Site Condition Report is to provide a factual statement of the condition of the site at the time of issue of the Environmental Permit. The Site Condition Report must describe the nature and distribution of potentially polluting substances in the ground and groundwater at the site prior to the commencement of operations under the Environmental Permit, and those handled during the course of the permitted operations. The potentially polluting substances of interest are those which are to be handled at the site under the Permit, and include raw materials, waste materials and by-products that are generated by the process.

6.1.4 The proposed development comprises the restoration of a flooded section of Skelbrooke Quarry Extension Area via infilling with non-hazardous wastes. However, this section of the ESSD focuses on the condition of the areas of the site which will not be subject to the permanent deposit of wastes, which for this site will be restricted to a section of the internal access road and the land to the immediate north and south of the areas to receive permanent deposits of waste. The waste that will be disposed at the site will be non-hazardous in nature and as such it should present little chance of pollution or contamination. Notwithstanding this, the proposed development is described in **Section 2.1.2** which allows derivation of the types of contaminants to be considered.

6.2 Condition of Land at the Permit issue

Sources of Information

6.2.1 The base information this report has been determined from a review of available published information, including:

- BGS 1:50,000 scale geology maps
- Environment Agency web-based data
- DEFRA's MAGIC Interactive mapping tool
- Data.gov.uk web-based data
- Historical web-based online mapping and imagery

Development History

6.2.2 A full description of the development history of the site and surrounding areas is provided in **Section 2.0**.

6.2.3 In summary, it can be noted from the analysis of maps dating back to the turn of the nineteenth century, that the site was previously undeveloped field and comprised and associated hedgerows. Quarrying activities within the surrounding area have been present since the mid- 1800's, with mineral extraction confined to the central area of the extension site. As discussed, the

associated void is now flooded. Maps dating back to 1906, depict The South Yorkshire Junction Railway is to the west of the site, occupying the area now utilised for the access road.

6.2.4 The area to the north of the flooded part of the extension area has remained as agricultural land throughout time and to the present day. However, during the early 2000's, the area of land to the south of the flooded area was utilised for stockpiling purposes to support the adjacent quarrying operations. By 2008, hardstanding and temporary access roads were implemented within the southern area of the site, which later underwent seeding and subsequent restoration to grassland.

6.2.5 As previously alluded to, beyond the boundary of Skelbrooke Quarry Extension Area the development history has been limited to the mineral extraction and subsequent landfilling activities at the adjacent main Skelbrooke Landfill facility which is located to the immediate west of the site access road. In addition to this, Doncaster MBC dilute and disperse landfill was situated to the east which was operational from 1976. Other than the quarrying and landfilling activities the surrounding area is comprised of predominantly rural/agricultural land, interspersed with residential properties, particularly those associated with the small village of Skelbrooke, to the north east of the site.

Geology

6.2.6 A detailed description of the regional and local geology and hydrogeology is present in **Section 3.2**. The site lies on the western margin of the Vale of York and has been developed in the Permian Magnesian Limestone formation. Regionally, Carboniferous Coal Measures lie to the west, and younger, Triassic Sherwood Sandstone lies to the east. The quarries complex at Skelbrooke were excavated into the Upper Magnesian Limestone, or Brotherton Formation.

6.2.7 The Permian sediments in the area of the site dip gently (approximately 2 degrees) to the east and the quarry itself is bounded by two faults, one to the north west and one to the south east.

6.2.8 Upper Marl (Roxby Formation), which overlies the Upper Magnesian Limestone, is present in the extension and comprises soft to firm brown clay. The Upper Magnesian Limestone (Brotherton Formation) is a competent fine-grained pale grey to buff limestone. The base of the Brotherton Formation falls from 24m AOD to 10m AOD across the extension area from west to east. The Middle Marl (Edlington Formation) underlies the Upper Magnesian Limestone and comprises grey to white rich brown mudstones.

6.2.9 A remnant of in-situ limestone remains between the main adjacent landfill area and the extension area, along the length of the site access road. This area has remained unworked due to it previously being the route of a railway line.

6.2.10 There are limited superficial deposits are the site which comprise Till, Mid Pleistocene lacustrine deposits of Clay and Silt. As previously mentioned, a full description of the superficial geology is included within **Section 3.2**.

Hydrology

6.2.11 The hydrology of the site has been discussed in **Section 3.3**.

Hydrogeology

6.2.12 The hydrogeology of the site has been discussed previously in **Section 3.4**.

Mineral Sites and Hazardous Facilities

6.2.13 There are two closed landfills and one operational landfill located within 2km of the Skelbrooke Quarry Extension Area.

6.2.14 The site lies adjacent to the main Skelbrooke Landfill site (to the south and west). Quarrying began in the mid-1800's and subsequent landfilling of the main site commenced in 1992, with the development of Phase 1 by Darrington Quarries. The main site was licenced to accept hazardous, non-hazardous and inert wastes. During May 2007, final capping and restoration procedures commenced following the completion of landfilling operations.

6.2.15 The Doncaster MBC Restored Dilute and Disperse Landfill site lies approximately 30m to the southeast of the Skelbrooke extension area. This landfill was operated by Doncaster Metropolitan Borough Council (MBC) from 1976 and accepted household, commercial and industrial and difficult wastes. It had a reported capacity of $1Mm^2$.

6.2.16 The closed Bannister Lane and Parkwood Landfills are situated c. 660m and c. 1km to the North East of the site respectively.

6.2.17 Currently, Catplant Quarry Ltd operates a quarry and landfill site (Hazel Lane Quarry) approximately 800m to the west of the site. This site is permitted to carry out landfilling of non-hazardous (and smaller fraction inert) wastes to support the restoration of the mineral extraction void of Hazel Lane Quarry.

Environmental Regulatory Authorisations

6.2.18 The site is located within a greenfield area and is relatively isolated; there are no COMAH (Control of Major Accident Hazards) establishments in the area.

History of Incidents

6.2.19 Previously, at the adjacent main Skelbrooke Landfill, plant existed on site which coated extracted limestone and aggregates with bitumen, and possibly tar, in order to created coated roadstone. This was then supplied to the local authority. There are no pollution incidents recorded at the site.

6.3 Permitted Activities

6.3.1 The area under the consideration of this ESSD will comply to waste management activities whereby waste will be temporarily tipped and stored on the southern edge of the flooded void to enable initial inspection of waste prior to being pushed into the flooded area or alternatively, spread cover the non-flooded sections of the restoration areas.

Potential Contaminants

6.3.2 As a result of the nature of the waste to be deposited within the void, there are not considered to be any potential contaminants originating from the waste. The waste will comprise of soils and other similar material principally originating from areas local to the site. This will ensure homogeneity with the local material at and immediately surrounding the site.

6.3.3 The only potential polluting substances within the site are oils and fuels from plant, equipment and vehicles (primarily delivery vehicles). The access routes are surfaced with tarmac and concrete which will prevent the downward

percolation of potentially polluting substances. It is highly unlikely that spills of this nature would pose a significant threat to the condition of the land.

6.4 Conclusions

6.4.1 The information presented within the preceding sections of this report establishes the baseline site conditions for the extension area, in terms of geology, surface water and groundwater conditions and their sensitivity. That being said, the proposed baseline conditions are limited by the presence of several other landfills within close proximity to Skelbrooke Landfill site and are, therefore, subject to change.

6.4.2 The historic land use of the site, detailed in **Section 2.2,** does not identify any significant potentially contaminative land uses, other than the previous manufacture of coated roadstone.

6.4.3 Potential contaminants associated with such activities are fundamentally different to those associated with infilling operation and accordingly, it is considered that the baseline conditions with regard to proposed waste recovery development are well understood.