Two Oaks Quarry: Site Monitoring Plan

Prepared for Mansfield Sand Ltd

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CONFIDENTIAL

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Quality Control Sheet

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1 INTRODUCTION

1.1 Background

Mansfield Sand Company Ltd (Mansfield Sand) has planning permission to work silica sand mineral in four phases. Mansfield Sand proposes to restore Phase 1 to agricultural land and heathland using inert and non-hazardous waste restoration materials at Two Oaks Quarry (the Site) near Mansfield, Nottinghamshire. Mansfield Sand proposes to carry out the backfilling and Site restoration under a deposit for recovery Environmental Permit within Phase 1 only. The application for the Environmental Permit is being made by Envireau Water on behalf of Mansfield Sand. Full details of the proposed infilling operation and Site restoration are set out in the Environmental Site Setting and Design (ESSD) report that accompanies the application (Envireau Water, 2024a).

This report is the Site Monitoring Plan (SMP) prepared by Envireau Water in support of the permit application.

1.2 Scope of Work

This SMP has been prepared in accordance with Environment Agency guidance (Environment Agency, 2003) and the findings of the Hydrogeological Risk Assessment (Envireau Water, 2024b). This SMP should be read in conjunction with the HRA and ESSD (Envireau Water, 2024a; Envireau Water, 2024b) and includes the following:

- Groundwater monitoring scheme (Section 2);
- Surface water monitoring scheme (Section 3); and
- Other monitoring requirements (Section 4).

1.3 Data Sources

The information and assessments in this report are based on:

- Proposed development and restoration plans provided by Mansfield Sand;
- Groundwater and surface water quality data collected by Mansfield Sand; and
- Reports for the Site by Envireau Water (Envireau Water, 2024a; Envireau Water, 2024b)

2 GROUNDWATER MONITORING

2.1 Monitoring Locations

Groundwater levels and quality in the Chester Formation of the Sherwood Sandstone Group will be monitored at the monitoring boreholes listed in Table 1 and shown on Figure 1. The monitoring boreholes have been positioned to ensure monitoring occurs both up and down hydraulic gradient of the proposed restoration works.

Table 1 Groundwater monitoring boreholes

Borehole	Easting	Northing	Depth (m)	Rationale
WM07/1	453205	357375	25.9	Up-gradient of all works occurring on site
WM/2	453728	357121	32.5	Up-gradient of waste recovery area
WM07/3	453410	356295	25	Located between lagoons 9 and 7/8
MBHA	453341	356810	30.4	Across hydraulic gradient of the waste recovery area in northern part of the Site
MBHB	454054	356782	30.4	Located between the waste recovery area and downgradient receptors

Monitoring will only be carried out in the Chester Formation. Due to the presence of the underlying low permeability mudstone strata and hydraulic gradient on-site, the flux from the restoration material will be confined to the Chester Formation.

2.2 Monitoring Measurements and Schedules

Groundwater levels will be measured manually on a monthly basis with groundwater quality being monitored on a quarterly basis with some organic species being analysed annually. The parameters to be measured and frequencies are detailed in Table 2.

Table 2 Groundwater monitoring and sampling frequency

Locations	Monitoring type	Water Level monitoring	Details
WM07/1 WM/2 WM07/3 MBHA MBHB	Water level	Monthly	Water level from the top of the casing will be collected by field staff and converted into groundwater elevations using a bespoke spreadsheet
	Water quality	Quarterly	Field: pH, EC, Temp, Laboratory: pH, EC, Alkalinity as CaCO3, ammoniacal nitrogen, chloride, nitrate, nitrite, sulphate, TOC filtered, calcium, sodium, magnesium, potassium, arsenic, iron, manganese, antimony, cadmium, chromium, copper, lead, nickel, selenium, zinc, barium, mercury, molybdenum, antimony, fluoride

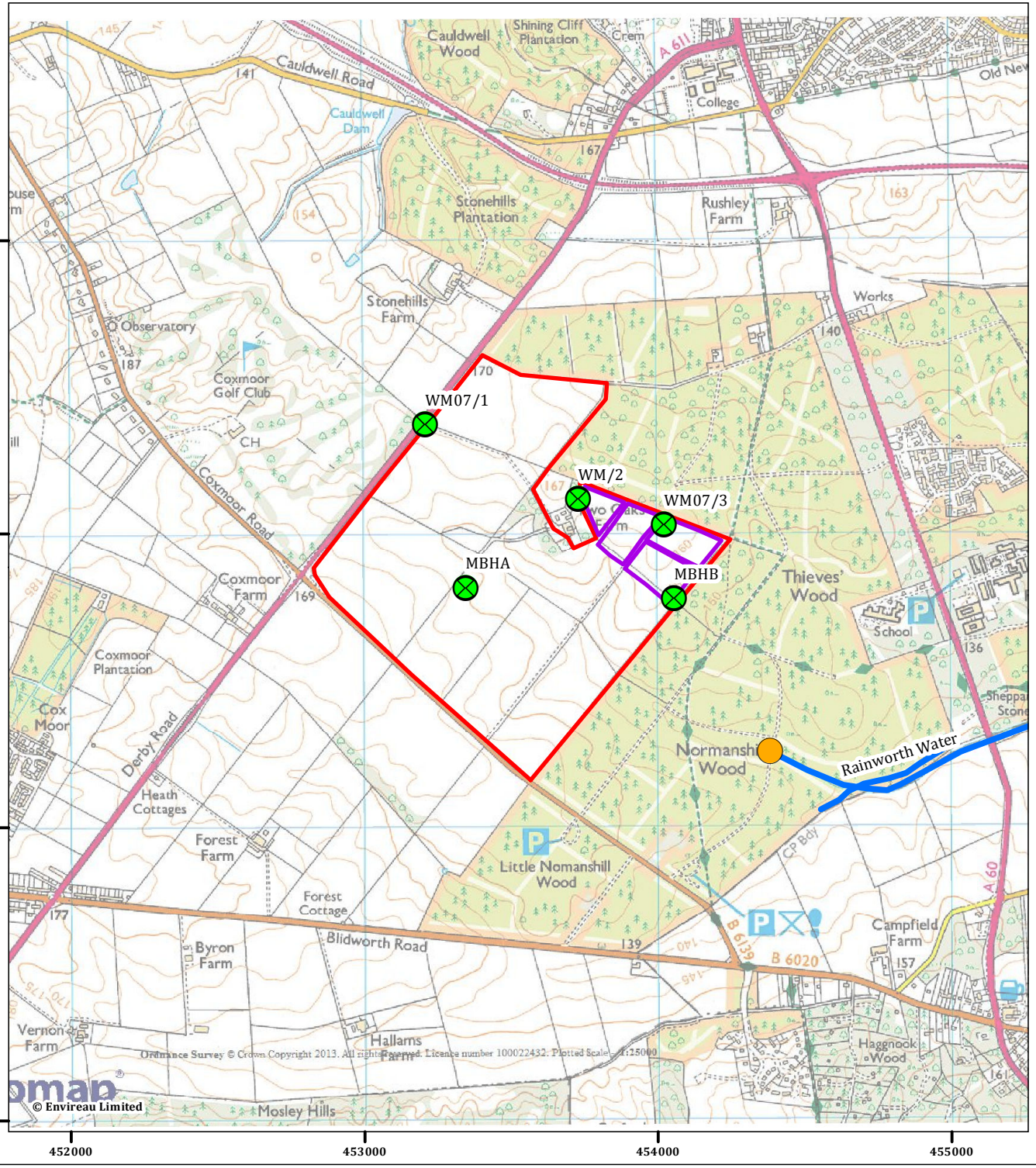
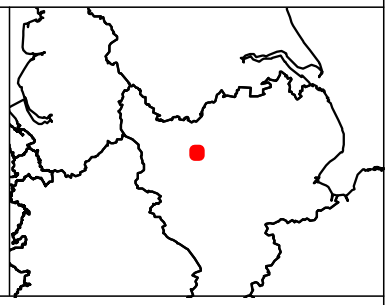


Figure 1: Site Monitoring Plan

Mansfield, Nottinghamshire

- Site Boundary
- Waste Recovery Boundary
- Surface Water Monitoring Location
- Groundwater Monitoring Borehole

Notes:



0 250 500 750 1,000 Meters

Scale: 1:20,000 at A4

01 November 2023

NGR: 453,524 E / 356,888 N

Project No.	3490476
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Drawn by:	MT
Ref:	FIG Site Monitoring Plan

envireau WATER

2.3 Control Levels and Compliance Limits

2.3.1 Locations and values

Control Levels and Compliance Limits will be set for MBHB, located down-gradient of the waste recovery area. Control levels and compliance limits will be set for three determinands: ammoniacal nitrogen, chloride and arsenic. Ammoniacal nitrogen is generated during the biodegradation processed of organic rich soils or wood that may accidently be accepted at the Site. Chloride is not retarded or degraded by any environmental processes and is therefore a good choice as a conservative tracer. Arsenic has been selected as it can be present in clay material and is a hazardous substance.

At the time of writing, only five sets of data have been collected to date. As such derived Control Levels and Compliance Limits will be calculated prior to the start of operations using the full baseline monitoring dataset.

3 SURFACE WATER MONITORING

3.1 Monitoring Locations

No water is discharged from the Site. Only Rainworth Water has been identified within the local area and is considered suitable for sampling. The start of Rainworth Water within Normanshill Wood varies seasonally dependent on groundwater levels and, therefore, the precise sampling point will also vary seasonally.

Surface water quality will be monitored at one location detailed in Table 3 and shown on Figure 1.

Table 3 Surface water monitoring locations

Location	Easting	Northing	Rationale
Rainworth Water	457546	166342	Although this feature does not receive direct discharge from the Site, Rainworth Water is a key receptor located downgradient from the water recovery area

During the waste recovery operations and following restoration, monitoring will continue to determine if the Site is impacting on the surface water feature.

3.2 Monitoring Measurements and Schedules

Surface water quality will be measured on a quarterly/annual basis while the permit is active. The parameters to be measured and frequencies are detailed in Table 4.

Table 4 Surface water monitoring determinands and sampling frequency

Location	Monitoring type	Water Level monitoring	Details
Rainworth Water	Water quality	Quarterly	Field: pH, EC, Temp, Laboratory: pH, EC, Alkalinity as CaCO3, ammoniacal nitrogen, chloride, nitrate, nitrite, sulphate, TOC filtered, calcium, sodium, magnesium, potassium, arsenic, iron, manganese, antimony, cadmium, chromium, copper, lead, nickel, selenium, zinc, barium, mercury, molybdenum, antimony, fluoride

4 BREACH RESPONSE PROCEDURE

4.1 Control Level

Should Site monitoring data show an exceedance of the Control Level, Mansfield Sand will analyse results from the past 12 months for the affected monitoring point. If only one of the last four results have breached the Control Level, no further action will be taken, other than to note that a breach has occurred. If two or more of the last four sampling results have breached the Control Level, then the monitoring point will be re-sampled as soon as possible.

If the repeat sample also exceeds the Control Level the following steps will be taken:

- Data from the monitoring points exceeding the Control Level and adjacent monitoring points will be reviewed to establish the presence of any trends.
- If the monitoring point with an exceedance is a borehole, groundwater levels will be reviewed to determine whether the Site activities could be responsible for any change in groundwater quality.
- A preliminary inspection will be undertaken to determine whether there has been:
    - Any unusual activity or occurrence at or around the Site that could account for the change in groundwater quality.
    - Any spillage of contaminants at the surface in the vicinity of the affected monitoring point.

Mansfield Sand will assess all the above information and specify a course of action on future monitoring. The Environment Agency would be notified of the breach and course of action taken.

4.2 Compliance Limit

Should any Compliance Limit be exceeded in one monitoring point on one occasion, the monitoring point will be re-sampled as soon as possible after receipt of the results. These initial steps will be used to eliminate errors that might be introduced during sampling, field analysis or laboratory analysis. If this second sample does not exceed the Compliance Limit, then no further action will be taken, unless it exceeds the Control Level in which case the procedures set out above will be followed.

If the additional repeat sample also exceeds the Compliance Limit, then:

- Data from the monitoring point exceeding the Control Level ((i.e., data falling below the Compliance Limit) and adjacent monitoring points will be reviewed to establish the presence of any trends.
- If the monitoring point with an exceedance is a borehole, groundwater levels will be reviewed to determine whether the Site activities could be responsible for the change in groundwater quality.
- A preliminary inspection will be undertaken to determine whether there has been:
    - Any unusual activity or occurrence at or around the Site that could account for the change in groundwater quality.
    - Any spillage at the surface in the vicinity of the affected monitoring point.
- The monitoring frequency will be increased for an agreed set of determinands in the affected monitoring point and adjacent monitoring point until the determinand concentration falls below the Compliance Limit.

- If the laboratory results from the more frequent monitoring show no indication of decline over a four month period, and the evidence indicates that the Site is the most likely cause of the increase in concentrations, then an HRAR will be carried out.
- The HRAR will be prepared by an appropriately qualified person and will include an assessment of the cause of the breach and an assessment of the effects on groundwater and/or surface water quality. The report will assess any implications on the groundwater and surface water resource to determine if the impact is significant. Recommendations for remedial actions will be made if considered necessary.

5 OTHER MONITORING

5.1 Gas

Due to the chemically inert nature of the restoration material to be used in the recovery operation, Environment Agency guidance states that new inert landfills do not pose a landfill gas hazard (Environment Agency, 2014). Accordingly, management and monitoring infrastructure are not required and will not be installed.

5.2 Rainfall and Weather

Weather warnings from the Meteorological Office will be monitored to ensure that any risks that could pose a risk to operations arising from adverse weather conditions can be managed appropriately. For example, should there be severe winds, dry material will not be accepted on that day.

Daily weather conditions will be recorded in the Site diary. A rain gauge or weather station will not be installed at the Site. The nearest Environment Agency rain gauge is at Newstead Abbey (ID 3775), located 2.6 km from the Site. Rainfall data from this rain gauge will be used in any future water balance calculations, should these be required.

6 QUALITY CONTROL AND REPORTING

Monitoring will be undertaken by suitably trained person(s) appointed by Mansfield Sand, who are familiar with best practice environmental monitoring procedures. The monitoring personnel will have access to the Environmental Permit and any relevant accompanying application documents to gain an understanding of the conditions applicable to groundwater monitoring (levels and quality). Personnel will also be familiar with the assessment criteria to identify compliance and assessment levels.

All field monitoring results for groundwater level and water quality and all laboratory results will be stored in Mansfield Sand's Database. Mansfield Sand will ensure data is sent to the Environment Agency in an agreed format at quarterly intervals.

REFERENCES

Envireau Water. (2024a). *Two Oaks Quarry: Environmental Setting and Site Design.*

Envireau Water. (2024b). *Two Oaks Quarry: Hydrogeological Risk Assessment.*

Environment Agency. (2003). *Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water LFTGN02.*

Environment Agency. (2014). *Guidance on the Management of Landfill Gas.* LFTGN03.