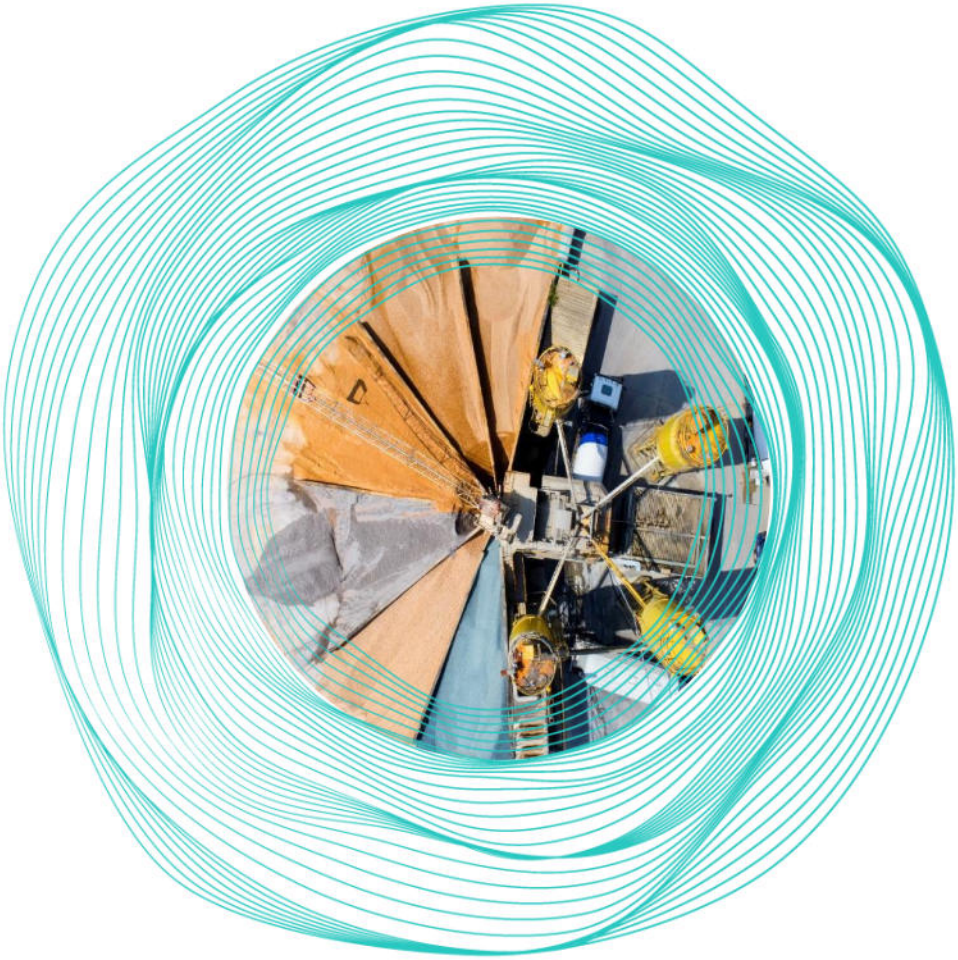
SGN PLACE

Verification Report – Volume I

SGN Littlehampton Holder Station at Harwood Road, Littlehampton

Document No. Rev 0: 415001-00022_09704
June 2026



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PROJECT 415001 00022_09704 Littlehampton Remediation Verification Report							
Rev	**Description**	**Originator**	**Reviewer**	**Worley Approver**	**Revision Date**	**Customer Approver**	**Approval Date**
Rev A	Draft for Comment	B Davison	C. Kirk	E. Lewis	23 March 2026	SL	10 June 2026
Rev 0	Final	p [redacted] B Davison	C. Kirk	E. Lewis	10 June 2026	SL	

Executive Summary	
Site Location/ Description	The SGN Place owned land is located at Harwood Road, Littlehampton, ('the site'), is immediately adjacent to the north-west of a railway line, and is located in a mixed residential, commercial and industrial area. The River Arun is located approximately 105 m south of the site. The site is roughly square in shape and occupied by one redundant above ground gasholder and associated plant which includes a former PRS housed in a raised plateau in the south-eastern portion of the site. A secured compound is located in the western corner of the site which is currently leased to Cellnex and used as a telecoms mast compound. An electricity substation is located in a secured compound off-site adjacent to the northern site boundary. The site is generally level with an elevation increasing from the north-west to the south-east approximately between 2.08 to 3.00 metres Above Ordnance Datum (m AOD). The raised plateau of Area A is in the south of the site which has a flat top and follows the general topography of the site; therefore, it is approximately 1 m higher on its northern boundary compared to its southern boundary. Surface cover prior to the works comprised the following: hardstanding (44%), softstanding gravel (29%), and above ground gasholder (27%).
Works Overview	Worley Consulting was commissioned by SGN to undertake NEC3 Project Manager Services & Supervision for remediation works at the site. The works were undertaken under the SGN Gasholder Demolition and Land Remediation Framework (ref. FW809) project under Option A Priced Contract with Activity Schedule of the NEC3 Engineering and Construction Contract (April 2013), and the Project Works Information (Worley Consulting, 2025). The NEC3 Project Manager was Emily Lewis and the NEC3 Supervisor was Brooke Davison, both of Worley Consulting. Erith was appointed as the Principal Contractor (the Contractor) for the works and was responsible for all activities on site during the works. The works were managed by the Contractor's Project Manager Darren Shephard. Environmental improvement works were undertaken at the site to address potentially unacceptable risks to controlled waters. The works completed comprised the following: • Removal/decommissioning of four monitoring wells; • Removal of raised plateau and historical gas infrastructure and pipework (including the Mono Ethylene Glycol (MEG) tank) to ground level in Area A, placement of geotextile membrane and capped with Type 1;

	• Excavation and removal of contents of the below-ground former gasholder tank (Area B) infilled with class 1.15 m of 6F5 material and capped with 0.15 m of Type 1; and, • Excavation and removal of impacted material within the north-eastern corner of the site (Area C) followed by the placement of 1.9 m of Class 6F5 material and capped with 100 mm Type 1 material. A 1 m wide x 2.5 m deep clay cut off wall using Class 7J material installed along the northern and eastern site boundaries. No additional works were undertaken outside of the remediation area.
Enabling Works	Enabling works were undertaken in advance of the remediation works between 4 and 11 August 2025. Given the limited size of the site, the aim of the enabling works was to pre-classify the soils scheduled for disposal within each remediation area by advancing trial pits and collecting soil samples to enable an appropriate landfill to be sourced and prevent the stockpiling of material on-site. The enabling works comprised the following key elements: ▪ Completion of a pre-works Condition Survey and completion of background monitoring; ▪ Completion of a topographic survey prior to the commencement of any intrusive works; ▪ Establishment of temporary dust and debris netting around the fenced perimeter of the site (unable to be completed due to extreme wind conditions on site); ▪ Site access/fencing access and egress arrangements; ▪ Service identification and protection; ▪ Establishment of working areas; ▪ Establishment of monitoring points (as required); and, ▪ Completion of one round of groundwater monitoring and sampling prior to commencement of any intrusive works, one round of groundwater monitoring and sampling during the intrusive works and three rounds of groundwater monitoring and sampling post completion of the intrusive works.
Earthworks	Earthworks works were undertaken between 12 August and 3 October 2025. During the works, a total of 365.68 tonnes of non-hazardous waste material (Area A) and 640.83 tonnes of hazardous waste material (Area B and C) was excavated and disposed of to a suitably licenced landfills in London.
Reinstatement	Excavations were backfilled with acceptable earthworks materials imported to site undertaken between 11 September and 6 October 2025.
Environmental Monitoring	Background monitoring was completed on 15 and 30 July 2025 prior to site mobilisation.

Executive Summary	
	Noise, vibration, dust, and vapour monitoring were undertaken daily throughout the works. No issues were identified.
Accidents/ Incidents, Near Misses	No accidents, incidents, near misses, environmental incidents or security issues were reported during the works.
Final Site Condition	The objectives for the works as defined in the Project Works Information (Worley Consulting, 2025) have been achieved.

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1. Introduction

1.1 Overview

This report provides information associated with the environmental improvement works commissioned by SGN to address the statutory land contamination risks SGN Place landholding at the Former Littlehampton Holder Station (1388P), Harwood Road, Littlehampton, Sussex, BN17 7AU (herein referred to as 'the site'. The statutory land contamination risks identified by the Designer associated with the soil (saturated and unsaturated) and groundwater contamination at the north-eastern and south-eastern portions of the site titled Areas B and C respectively, and removal of raised plateau in the southern portion of site titled Area A.

The environmental improvement works comprised the following:

- Removal/decommissioning of four monitoring wells;
- Removal of raised plateau and historical gas infrastructure and pipework (including the Mono Ethylene Glycol (MEG) tank) to ground level in Area A, placement of geotextile membrane and capped with Type 1;
- Excavation and removal of contents of the below-ground former gasholder tank (Area B) to be infilled with 1.15 m of class 6F5 material and capped with 0.15 m of Type 1; and,
- Excavation and removal of impacted material within the northern corner of the site (Area C) followed by the placement of 1.9 m of Class 6F5 material, and capped with 100 mm Type 1 material. A 1 m wide x 2.5 m deep clay cut off wall using Class 7J material installed along the northern and eastern site boundaries.

1.2 Structure of Verification Report

This Verification Report comprises two volumes:

- Volume I (this report): provides an overview of the works undertaken and the final site conditions at completion of the works, and is set out in Table 1 Report Structure; and,
- Volume II: contains supporting documentary evidence relating to the earthworks activities (digital format only). A list of Volume II contents is included in the table of contents section of this report.

Table 1 Report Structure

Section	Contents
Section 1	Introduction – Includes background information and presents the site setting
Section 2	Project Management – Includes roles and responsibilities of relevant parties
Section 3	Works Overview – A description of the methodology used in the project, with detail of the objectives and design strategy
Section 4	Enabling Works – This section provides details on the enabling works undertaken to facilitate the earthworks
Section 5	Remediation Works – This section contains an account of the works, including detailed descriptions of earthwork activities, reinstatement works, disposal and import of material
Section 6	Verification – This section documents sampling and verification of excavation extents, imported materials and earthworks compaction
Section 7	Environmental Monitoring – This section includes details of the health, safety and environmental monitoring carried out over the duration of the works
Section 8	Final Site Conditions – Describes site conditions post works
Section 9	Essential Wayleaves
Section 10	Warranties/Contract Maintenance
Section 11	Contact Details
Section 12	Health, Safety and Environment
Section 13	References

1.3 Previous Site Investigation Reports

The following factual reports have been prepared for the site previously:

- Factual Report on a Contaminated Land Boundary Survey. British Gas (South Eastern) Plc, Gloucester Road, Littlehampton, West Sussex. Harrison & Company, reference C1 935/11, dated 1992;
- Environmental Assessment (Desk Study Factual Report). BG Plc Property Division, Gloucester Road, Littlehampton, Sussex. White Young Green, reference 127735, dated 1999;
- Environmental Assessment Site Investigation, Final Factual Report. Lattice Property Holdings, Gloucester Road, Littlehampton. WS Atkins, reference 137647, dated 2001;

- Desk Study Review & Factual Report. SGN Holder Site, Gloucester Road, Littlehampton. Hydrock, reference GRL-HYD-XX-GI-RP-GE-1001, dated 2017;
- Environmental Assessment, Factual Site Investigation Report. SGN Place Limited, Littlehampton Holder Station (1388P), Hardwood Road, Littlehampton, Sussex. Advisian, reference 305008-00031_09701, dated 2023;
- Environmental Assessment, Additional Trial Pitting Site Investigation. SGN Place Limited, Littlehampton Holder Station (1388P), Hardwood Road, Littlehampton, Sussex. Advisian, dated 2024; and
- Geotechnical Ground Investigation, Factual Report. Worley Consulting, Harwood Road, Littlehampton. CC Ground Investigations Ltd, reference C8391, dated 2024.

1.4 Site Location & Description

A summary of the site location and description are presented in Table 2 below.

Table 2 Site Details

Aspect	Information
Site Ownership & Code	SGN Place 1388P
Site Address	Harwood Road, Littlehampton, Sussex, BN17 7AU. The site location is presented as Appended Figure 1
National Grid Reference	5012212, 102464 (approximate centre of site)
Site Area	0.4 ha
Site Setting	The site is located in the north-west of Littlehampton in a mixed residential, commercial and industrial area, and immediately adjacent to the north-west of a railway line. The River Arun is located approximately 105 m south of the site. The site is roughly square in shape and occupied by one redundant above ground gasholder and associated plant which includes a former PRS housed in a raised plateau in the south-eastern portion of the site. A secured compound is located in the western corner of the site which is currently leased to Cellnex and used as a telecoms mast compound. An electricity substation is located in a secured compound off-site adjacent to the northern site boundary. The site layout and proposed remediation areas are presented as Appended Figure 3.
Surrounding Area	***North***:

Aspect	Information
	▪ Commercial premises including a pest control service, metal supplier and vehicle repair shops. ***East***: ▪ Commercial property including foam and electronics manufacturing facilities. ▪ Residential properties are located approximately 7 m southeast of the site boundary. Adjacent to the eastern boundary. ***South***: ▪ The River Arun is located approximately 105 m to the south of the site. ▪ A railway line runs adjacent to the south-western site boundary separated by a public footpath that runs the length of the south-western site boundary. ***West***: ▪ A railway line and commercial properties including a tyre shop, vehicle repair shop, car wash and garage.
Ground Cover	Surface cover (pre works) comprised the following: ▪ Hardstanding (tarmacadam): 44 %; ▪ Softstanding (gravel): 29 %; and, ▪ Above ground gasholder: 27 %.
Site Topography and Elevation	The site is generally level with an elevation increasing from the north-west to the south-east approximately between 2.08 to 3.00 metres Above Ordnance Datum (m AOD). The raised plateau of Area A is in the south of the site which has a flat top and follows the general topography of the site, therefore, it is approximately 1 m higher on its northern boundary compared to its southern boundary.

1.5 Site History

Historical information pertinent to the site is summarized below and is based on historical Ordnance Survey mapping data as presented in Advisian's Factual Site Investigation Report (Advisian, 2023). Historical structures formerly present at the site are presented as Appended Figure 2.

The site forms part of the former Littlehampton Gasworks.

Littlehampton Gas Co. Ltd began producing gas on-site from 1890. The gasworks extended off-site to the north and east with a gasholder and retort house located on-site. A second gasholder and purifiers were located off-site approximately 15 m north-east and 20 m north of the site.

A third gasholder was constructed to the east and the gasworks started to produce sulphate ammonia (for fertilizer production) by 1900. By 1927, carbureted water gas (CWG) was also being produced at the gasworks (Russel Thomas, 2020).

In 1934, the gasworks was acquired by Brighton gas company and ceased operation in 1935.

In 1965, a Wiggins gasholder (3,000,000 cu. Ft capacity), electricity substation, raised platform housing an instrument room, control room and electrical room, were constructed on-site and remain in their present configuration.

By 1982 the gasholder to the east of the site was demolished and no significant development is understood to have occurred until the construction of the gas governor (off-site to the east).

1.6 Geology

1.6.1 Regional

No made or artificial ground is recorded as present regionally on British Geological Survey (BGS) online mapping data (1:50,000 data; BGS, 2025).

BGS online mapping data (1:50,000 data; BGS, 2025) indicates that the superficial geology of the site is Raised Marine Deposits, comprising '*clay, silt, sand and gravel*'.

Superficial deposits are further underlain by bedrock comprising undifferentiated chalk of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation.

1.6.2 Site Specific

A summary of the ground conditions encountered beneath the site in Area B based on a site investigation undertaken by Worley Consulting in 2023 is presented in Table 3 below.

Table 3 Summary of the Site Specific Ground Conditions

Proven Thickness (m)	Geological Description
0.90 –2.30	**Made ground (outside of below ground gasholder tank):** Sands, gravels and clays comprising brick, concrete, flint, coal, clinker, coke, chalk, ash, wood, metal, sandstone, glass, ceramic, granite and charcoal.
1.25 (gasholder base)	**Made ground (inside below ground gasholder tank)**: Sandy clayey gravels comprising brick, concrete, coal, coke, clinker, ash, chalk and slate.
0.90 – 11.45 (where proven)	**Superficial Deposits:** Soft to firm brown, blue and grey gravelly clay and clayey sand. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of flint, chalk and shell fragments.

Proven Thickness (m)	Geological Description
2.70 – 14.50 (not proven during previous site investigations)	**Solid Geology:** Chalk composed of silts, clays, gravels and cobbles. Clasts and gravels are weak, low density of white chalk clasts and white rounded flints. Matrix is cream/white.

1.7 Hydrogeological Regime

The superficial deposits of the Raised Marine Deposits (predominantly cohesive at the site) are classified as a Secondary A Aquifer and the underlying Chalk bedrock a Principal Aquifer. It is likely that due to the cohesive nature of the superficial deposits, they act as a leaky aquitard, limiting the degree of hydraulic connection between the made ground and the underlying Chalk.

The surface water receptor of the River Arun (transitional surface waterbody and tidal) is located 105 m south of the site. The water body has a moderate ecological status (Environment Agency, 2026). Groundwater within the Chalk is understood to be tidally influenced. Continuous monitoring has not been undertaken in the superficial deposits.

The hydromorphology of the River Arun is noted to be heavily modified, with flood defenses (concrete wall and sheet piling wall) along the east bank of the river channel. This physical barrier is likely to prevent direct connectivity with shallow groundwaters at the site.

Groundwater flow direction has been interpreted to be towards the south-west in the superficial deposits and towards the south in the Chalk.

All groundwater bodies within England are designated Drinking Water Protected Areas (DrWPA) (Groundwater). DrWPA areas have been determined in order to protect groundwater from over abstraction and to prevent deterioration in groundwater quality that could increase the treatment of groundwater. The site is located within the operational catchment of the Littlehampton Anticline East groundwater body. The waterbody has a poor overall status, with a poor quantitative status element and a good chemical status element (Environment Agency, 2026).

The site is not located within a source protection zone (SPZ). The closest SPZ (Zone II – Outer Protection Zone) is located 3.3 km to the east. These are locations where raw water is abstracted for human consumption.

The site is not located within a Drinking Water Protected Area (Surface Water); however, the River Arun is designated (non-statutory) a DrWPA (surface water).

The site is not located within a Drinking Water Safeguard Zone (SgZ) (Surface Water) or SgZ (Groundwater). Safeguard Areas are identified where the protected area has been assigned at risk of failing the drinking water objectives of the WFD.

The works extend to approximately 1.3 m bgl in Area B and between 1.8 m bgl (southern portion) and 2.0 m bgl (northern portion) in Area C (2.5 m bgl in location of clay cut off wall).

Area B is underlain by between 2.2 m (WS23-04) and 0.65 m (MW23-05) of cohesive tidal flat deposits, while Area C is underlain by approximately 4.45 m (max proven depth in WS07) of cohesive tidal flat deposits. Works in Area A were above ground only.

It is noted that the above ground gasholder and associated partial below ground tank remain on site. The wider former gasworks is also located up hydraulic gradient to the north-east of the site.

1.8 Summary of Previous Site Investigation & Remedial Works

Six phases of desk study and site investigation works have been undertaken historically at the site, which are summarised below. Historical exploratory hole locations are presented on Appended Figure 2.

Harrison & Company, 1992:

Two phases of intrusive site investigation undertaken in July 1992 and October 1992, comprising the excavation of ten trial pits and drilling of four boreholes, mostly to 3 m bgl, but to a maximum depth of 5 m bgl with no monitoring well installations installed within the boreholes.

Made ground was encountered at all locations, overlying firm orange or grey brown sandy silty clay with occasional chalk gravel. Chalk was encountered in one trial put at 2.70 m bgl, which was described as soft brown mottled off white silty putty chalk.

Soil/diesel odours were identified in two of the excavations at 0.75 m bgl (TP2) in the current Area A and 1.6 m bgl (TP4) in Area C.

White Young Green Environmental, 1999:

A desk study was completed in 1999 which noted a PRS and a bunded mono-ethylene glycol (MEG) tank in the south of the site in what is now Area A.

Atkins, 2001:

Atkins undertook intrusive works at the site in 2000 comprising of three groundwater monitoring wells screened in the chalk, one had dug trial pit, five machine dug trial pits and seven window sample holes.

Made ground was found across the entire site to a maximum depth of 2.3 m bgl. The made ground was described as generally comprising concrete, brick, silt, sand, clay, chalk, gravel, coal and ash.

Natural strata was encountered as variably sandy gravelly clay (alluvium) underlain by soft white weathered chalk (Upper Chalk). The Upper Chalk was encountered from depths ranging from 6.4 m bgl to 10.7 m bgl.

Pockets of foul lime were noted in made ground in TP2 in the north-west corner of the site and TP3 approximately 4 m north of Area A. Asbestos cement was encountered in a number of

exploratory hole locations as well as being identified on the surface. An oily sheen and tarry odour was noted within groundwater encountered in BH1 which is within Area C.

Hydrock, 2017:

Hydrock undertook a site investigation in 2017 comprising of ten vacuum excavation pits (VE-01 to VE-010), four hand pits (HP-02 to HP-05), three rotary boreholes (MW-01 to MW-03) and eight windowless samples boreholes (WS-01 to WS-08). Subsequent groundwater monitoring rounds were also completed.

Made ground was encountered at all site investigation locations, to a maximum depth of 2.30 m bgl, comprising sandy, silty, gravel. Raised Marine Deposits were identified beneath the made ground, comprising sandy silty clay to a maximum depth of 7.00 m bgl. Slightly sandy gravelly silt with occasional flints were encountered beneath the Raised Marine Deposits. This was identified as the Lewes Nodular Chalk Foundation.

Visual and olfactory signs of contamination, in the form of sheen, occasional product and slight tar odours were observed within the Raised Marine Deposits at VE-03 and MW-03 which are approximately 10 m and 11 m north of Area B, respectively.

The tank base of the former on site gasholder was encountered at 1.0 m bgl in WS03 in Area A. Made ground at this location was reported to have a hydrocarbon sheen on surface and strong tar odour. Hydrocarbon product and suspected asbestos was recorded within this structure at VE04 adjacent to the north-eastern boundary of Area A.

Brick walls, believed to be the edge of a structure in the north-eastern corner of the site, which is now RArea C, was encountered between 0.40 m bgl and 0.90 m bgl in VE08 and WS05. A concrete slab was encountered at 0.60 m bgl in VE07 within the vicinity of the structure.

Tar in the form of non-aqueous phase liquid (NAPL) within fissures and tar staining was encountered within the Raised Marine Deposits in WS07 within Area C between 1.40 m bgl and 4.50 m bgl.

Asbestos in the form of chrysotile, amosite and anthophyllite loose fibres were found in made ground across the site between 0.1 and 0.8 m bgl (detected) in 14 of 26 samples). Chrysotile and crocidolite insulation lagging was present in HP01 and WS04 in the north-western portion of the site.

Advisian, 2023:

Advisian undertook intrusive works in 2023 at the site comprising of six groundwater monitoring wells (MW23-01, 03, 04, 05, 06D and 07) to a maximum depth of 14.50 m bgl, four vapour wells (VW23-01 to VW23-04A) to a maximum depth of 1.45 m bgl, nine vacuum excavation/hand dug trial pits (VE23-01 to VE23-09) to a maximum depth of 1.30 m bgl, three mechanically excavated trial pits (TP23-01 to TP23-03) to a maximum depth of 1.00 m bgl, and ten shallow hand dig pits (HP23-01 to HP23-10) to a maximum depth of 0.15 m bgl. Monitoring wells previously installed by Hydrock in 2017 (MW01, MW02, MW03, WS02, WS04 and WS07) were developed. Two rounds of subsequent groundwater and vapour monitoring rounds were completed.

The gasholder tank walls in Area B were identified in VE23-01, 02, 03 and MW23-06D between 0.35 to 0.64 m bgl and comprised of metal inner and outer wals, with an approximately 0.20 m gap between them. The base of the tank was encountered at 1.25 m bgl within MW23-06D and comprised of clinker, ash and black tarry gravels with a hydrocarbon sheen.

Made ground outside of the gasholder in Area B was encountered across he site up to depths of 2.30 m bgl, underlain by Raised Marine Deposits to between 0.90 and 11.45 m bgl. Chalk bedrock was encountered between 2.70 and 14.50 m bgl (depth of deepest borehole).

Visual and olfactory signs of gross contamination were typically confined to the south-east of the site in and around the below ground gasholder tank in Area B and in areas of previously identified free-phase NAPL in Area C, and an area to the north of the former retort house.

Advisian, 2024:

After the Advisian 2023 investigation SGN rationalised the gas plant layout on site. This involved demolishing the brick built kiosk and associated live equipment within the PRS located within the raised plateau.

SGN then commissioned Advisian to undertake further investigation of the following areas:

- The former below ground tank in the south-east of the site. The purpose of the investigation was to physically verify the lateral and vertical extent of the tank and to collect representative samples of the grossly contaminated material from within the structure to facilitate a remedial design.
- Northern corner of the site where brick structures/live services prevented previous intrusive works. The objectives were to investigate the obstructions and ground beneath them.
- The raise plateau area (previously a PRS). The objectives were to investigate the characteristics of the fill material in the above ground structure and collect analytical samples.

The findings of the additional works are summarised below:

Below Ground Tank (Area B):

Three trial pits were excavated within the footprint of the tank adjacent to the raised plateau.

A concrete base of the tank was located at 1.3 m bgl. Rapid ingress of water (moderate to tarry odour and sheen) was recorded at 0.8 m bgl. Three metallic gasholder walls (assumed to be the previous gasholder lifts) were identified (outer ring being the thickest and shallowest (0.05m thick at 0.20 m bgl) and the two inner rings thinner and deeper. Tar contamination was observed within the metallic walls.

The north-western portion identified greater visual tar contamination compared to the south-eastern portion of the tank. The north-western portion consisted of a clayey gravels of redbrick, concrete, flint, sandstone, and chalk with multiple pockets of black viscous tar.

The south-eastern half of the pit was less impacted by tar. Tar was identified within the clay adjacent to the metallic gasholder walls only. There were two different types of clay within this half of the tank. Orangish brown gravelly clay overlying a greenish grey slightly sandy clay (similar to the clay observed outside of the gasholder wall).

Northern Site Corner (Area C):

Five trial pits were excavated in a cross shape within the northern corner of the site. The trial pits were divided into sections (instead of two large trail pits) to facilitate accurate logging. Natural ground was encountered adjacent to the north east fence at 1.7 m bgl. In this location tar coated gravels and occasional pockets of tar were observed including thick viscous tarry sludge being discharged in the ground from a 300 mm metal pipe located at 0.7 m bgl.

The majority of the area to the south of the fence line comprised made ground over a brick foundation (to 1.4 m bgl). This was underlain by a concrete foundation to approx. 1.9 m bgl in places. Pockets of tarry sludge were observed within the made ground along with a second 300 mm metal pipe located at 0.75 m bgl which was discharging viscous tarry sludge. The natural clay material below the concrete foundation at 1.9 m bgl identified small pockets of black tar. Black tar staining was identified on the brickwork.

Numerous underground services we identified in this area – the majority were assumed to be associated with the former gasworks given they were damaged. A live BT cable was identified between 0.30-0.60 m bgl.

Raised Plateau (Area A):

Six trial pits were excavated across the raised plateau in the south of the site. The trial pits identified incompetent tarmacadam / slabs over sandy gravels, underline by gravelly clayey chalk before terminating on a concrete slab identified between 1.15-1.70 m bgl.

Given the depth of the concrete slab below the surrounding ground level, the structure is believed to have a below ground element. The structure is considered to be deeper in the east (approximately 0.9 m bgl) compared to the north western corner (approximately 0.15 m below the surrounding ground level). The structure also dips in the south western corner with the slab being approximately 0.7 m below the surrounding ground level (based on TP24 09).

Two of the trial pits located on the south east of the plateau identified a 0.1-0.2 m layer of dark sandy gravels on top of the concrete base. The dark sandy gravels did not identify any visual or olfactory signs of contamination

<u>CC Ground Investigations Ltd, 2024:</u>

CC Ground Investigations Ltd (CCGI) undertook a geotechnical ground investigation in 2024 comprising of the advancement and installation of one groundwater monitoring well to 23.70 m bgl.

Made ground was recorded between to 2.6 m bgl (concrete clasts encountered between 1.20 and 2.00 m bgl) and comprised of dark grey and brown gravelly, slightly clayey sand, with gravels comprising siliceous material, brick, slate, sandstone and clinker. The superficial Raised Marine Deposits was encountered between 2.60 and 9.50 m bgl and comprised of brownish slightly gravelly silty clay with occasional shell fragments. The solid geology of Undifferentiated Chalk was encountered as structureless chalk from 9.50 to 19.20 m bgl, and moderately weak medium density, Grace B3 from 19.20 to 23.70 m bgl with the base not proven.

Visual and olfactory signs of contamination, in the form of pockets of oil from 2.80 to 3.30 m bgl, moderate bitumous odour from 3.30 to 6.50 m bgl, and faint bitumous odour from 6.50 to 9.40 m bgl were observed within the Raised Marine Deposits at MW24-01.

Groundwater strike during drilling was recorded at 1.20 m bgl. Static groundwater was recorded 1.87 and 2.12 m bgl during subsequent monitoring rounds.

1.9 Pre Remediation Contaminant Linkages

Worley Consulting completed a Data Review in June 2024 which presented a high-level overview of previous site investigations and risk assessments used to refine Conceptual Site Monday (CSM) of the site and summarised those complete contaminant linkages requiring remediation. Contaminant linkages considered significant and identified as posing a potentially unacceptable statutory risk to controlled waters receptors are summarised in Table 4 below.

Table 4 Contaminant, Pathway & Receptor Linkage

Contaminant/ Remedial Area	Pathway	Receptor
Area B: Former Gasholder (eastern portion of site)	Leaching/Dissolution	Secondary A Aquifer
		Principal Aquifer
	Migration of NAPL/Groundwater	Surface Water
Area C: Free-Phase NAPL	Leaching/Dissolution	Secondary A Aquifer
		Principal Aquifer
	Migration of NAPL/Groundwater	Surface Water
Area C: Made Ground associated with former retort house	Leaching/Dissolution	Secondary A Aquifer
		Principal Aquifer
	Migration of NAPL/Groundwater	Surface Water
Off-Site Sources	Migration of NAPL/Groundwater	Secondary A Aquifer
		Principal Aquifer

2. Project Management

2.1 Contractual Issues

The works were undertaken under the SGN Gasholder Demolition and Land Remediation Framework (ref. FW809) project under Option A Priced Contract with Activity Schedule of the NEC3 Engineering and Construction Contract (April 2013), and the Project Works Information (Worley Consulting, 2025).

2.2 Health, Safety & Environment

The remediation contract was conducted in accordance with the requirements of the Construction (Design & Management) (CDM 2015) Regulations and SGN's Heath, Safety and Environment (HS&E) policy. These regulations place specific responsibilities on the Principal Contractor, Principal Designer, and Employer. These roles are described in Section 2.3.

2.3 Roles & Responsibilities

The principal parties involved in the project and their responsibilities are listed below. The HSE/CDM Regulations and environmental legislation define the roles and responsibilities of these parties. Contact information for parties related to the works is provided in Section 11.

- **SGN – Employer (Landowner) and Public Relations:**
  - Assist the Project Manager with the financial accounting and control of the works, and for the preparation of the contract documents;
  - Ensure a robust and consistent approach to management of health and safety issues associated with completion of construction works on behalf of the Employer;
  - Identify hazards and mitigate them where possible at the design stage and pass relevant site information to the Principal Contractor to enable them to produce appropriate methods of working;
  - Review and input on matters relating to H&S; and,
  - Liaise with neighbouring properties to inform of the work and any report on concerns they may have.
- **Worley Consulting –Principal Designer, Remediation Designer, NEC3 Project Manager, and NEC3 Supervisor:**
  - Plan, manage, monitor and coordinate health and safety in the pre-construction phase of the project;
  - Use due skill and care in designing a scheme that meets the Employers goals and is in accordance with current legislation/standards;

- Verify that the works have been completed in accordance with the design and the requirements of the Contract; and,
- Provide full-time supervision during the works to ensure successful completion.

- **Erith – Principal Contractor:**
  - Control the site during the works;
  - Implement the proposed scheme in a professional, safe, cost effective, and timely manner; and,
  - Responsible for all activities on site during the works and ensuring health and safety of workers, visitors and all other people and property that may be affected by the works.
- **Perses – Independent CDM-Advisor:**
  - Monitors CDM compliance;
  - Undertake site inspections and safety audits; and,
  - Review documentation.

2.4 Approvals

2.4.1 Utilities

The Contractor was responsible for liaising with SGN and UKPN prior to the commencement of the works. This was undertaken to agree safe ways of working within the vicinity of live gas mains and the off-site electrical substation.

2.4.2 Planning Permission

Planning permission was obtained for the works, via submission of an application to Arun District Council via the planning portal on 29 November 2024 under application number PP-13581818. The planning submission included the outline remediation design (Worley, 2025a), along with associated drawings and additional supporting documents.

Planning permission for the works was granted on 6 February 2025 for the above application. A copy of the decision notice is included in Appendix B (ii) (Volume II).

2.4.3 Materials Management Plan

A Materials Management Plan (MMP) was not prepared as no material re-use was undertaken at the site.

3. Works Overview

3.1 Description of Works

The works comprised the following elements as per the Worley Consulting Remediation Design and Project Works Information (PWI) (Worley Consulting, 2025):

- **Decommissioning of Monitoring Wells:**
  - Three groundwater (WS07, MW24-01 and MW23-06D) and one vapour (VW23-03) monitoring wells.
- **Area A:**
  - Excavation, removal and disposal off-site disposal of ground covering raised plateau comprising of sandy gravels and gravelly clayey chalk fill to be disposed at a suitably licensed waste disposal or soil treatment facility;
  - Cut and remove all historical gas infrastructure and pipework (including the Mono Ethylene Glycol (MEG) tank within the above ground element of the plateau to the extent of excavation and plugged with concrete;
  - Placement of a geogrid (TERRAM TX160) at excavation level;
  - In-situ Plate Load Tests undertaken at top of final formation level; and,
  - Placement of approximately 0.15 m of Type 1 fill on the geogrid.
- **Area B:**
  - Removal and off-site disposal of existing tarmac covering the below ground tank which will be disposed of at a suitable licensed facility;
  - Below ground gasholder tank to be dewatered and tankered off-site for disposal at a suitably licensed facility;
  - Excavation of all fill material within the gasholder tank to base of concrete slab and removal of all steel lifts;
  - Placement of 1.15 m of suitable Class 6F5 material with in-situ plate load tests undertaken at the top of formation level; and,
  - Placement of 0.15 m of suitable imported Type 1 fill atop the Class 6F5 material.
- **Area C:**
  - Removal and off-site disposal of existing gravel cover layer at a suitably licensed waste disposal facility;
  - Excavation of an area (107m^2) to approximately 2.0 m bgl (2.5 m bgl in location of clay cut off wall). Former foundations/structures will be removed to a depth of 2.0

m with material disposed of at a suitably licensed waste disposal or soil treatment facility;

- Removal of services once they are confirmed dead with live services being protected or re-routed;
- Former pipework associated with the gasworks will be excavated to the boundary of the remediation area where it will be cut and plugged with concrete and disposed of off-site;
- Installation of a 22.5 m long clay cut off wall on the north and west site boundary of the remediated area in the northern corner comprising of a 1.0 m thick wall installed to a depth of 2.5 m bgl;
- Placement of 0.2 m of suitable Class 6A material;
- Placement of 1.7 m of suitable imported Class 6F5 material with in-situ plate load tests undertaken at 0.5 m and the top of formation level; and,
- Placement of 0.1 m of suitable imported Type 1 full.

3.2 Site-Wide Remediation Strategy Overview

A Data Review & Outline Remediation Strategy (Worley Consulting, 2024) outlined the unacceptable risks to the controlled water (associated with the two primary source areas, Area B and Area C) and the necessary remediation, reinstatement and verification works required to maintain the site's current use and for its continued use as a redundant gasholder station and a proposed telecommunications compound.

The remedial strategy included the excavation and off-site disposal to landfill or soil treatment facility (Areas A, B and C), and, the installation of a clay cut off wall within the northern corner (Area C) of the site to prevent potential re-contaminating of the remediated area from up hydraulic gradient contaminant sources (e.g. off-site former gasworks).

Additionally, a quantitative risk assessment (QRA) completed for the site to derive target remedial criteria protective of the controlled water relevant to the proposed import material (Worley Consulting, 2024a). The criteria are considered to be protective of the controlled waters and human health (soils) and are considered appropriate to ensure protection of the identified receptors for both current and potential future use.

Further detail is included in the Remediation Design prepared for this phase of works (Worley Consulting, 2025).

3.3 Objective

The objective of the works was to provide a durable solution to mitigate unacceptable risks to controlled waters (associated with the two primary source areas) are to be reduced or removed by the most appropriate remedial options given the site constraints such that the site

is suitable for its continued use as a redundant gasholder station and a proposed telecommunications compound.

3.4 Import Criteria

A Quantitative Risk Assessment (QRA) for the site was completed to derive target criteria protective of controlled waters relevant to the proposed import material (Worley Consulting, 2024a).

Generic Assessment Criteria for Human Health suitable for a commercial land use scenario (based on 1% soil organic matter) are proposed as the target remedial criteria for proposed import material. Generic Assessment Criteria have been derived using the CLEA v.1.071 model and represent a minimal/negligible risk level.

As the environmental standards for certain modelled compounds are extremely low, in some instances, the remediation criteria are likely to be below the limit of detection (LOD) for the analytical techniques used to assess the soil/material samples. Should this scenario arise, the LOD shall be used as the remediation criteria. Erith shall request analytical methods that achieve as low as practicable LOD without using a non-accredited method.

The criteria are considered to be protective of controlled waters (leachate) and human health (soils) and are considered appropriate to ensure protection of the identified receptors for both current and potential future use. Soil and leachate criteria for imported material are presented in Section 6.2.1 below.

Further discussion of verification sampling for import and any associated exceedances, is presented in section Section 6.2.

3.5 Supervision of Works

Individuals carrying out the main supervision of the works included the following:

- Contractor's Site Agent: Mr Darren Shephard of Erith;
- Contractor's Site Supervisor: Mr Brian Read of Erith;
- NEC3 Project Manager: Mrs Emily Lewis of Worley Consulting; and,
- NEC3 Site Supervisor: Ms Brooke Davison of Worley Consulting.

Contact details for the relevant parties are provided in Section 11.

3.6 Public Consultation

SGN issued stakeholder letters to all immediate neighbours surrounding the site prior to works starting.

There were no queries in relation to the letters issued. Copies of the letters issued are included in Appendix B (i) (Volume II).

Erith managed all stakeholder and neighbour queries during the works.

3.7 Waste Management

3.7.1 The Landfill Directive (2010)

There are a number of requirements from the Landfill Directive 2010 (DEFRA, March 2010) that affect removal and treatment of material from site. The following points were applicable:

1. The operator of a landfill shall ensure that the landfill is only used for waste which is subject to prior treatment unless:

- It is inert waste for which treatment is not technically feasible; or,
- It is waste other than inert waste and treatment would not reduce its quantity or the hazards which it poses to human health or the environment.

2. A landfill cannot accept any waste in liquid form (including wastewater but excluding sludge).

3.7.2 Exported Material

The material excavated from Areas A, B and C was chemically tested and disposed to the following facilities:

- Asphalt Area A: NRS Meriden Aggregates Ltd – Cornets Ends Lane Recycling Facility, Meriden Depot, Coventry, CV7 7LG;
- Concrete from within Area A, Stockpiles A and B: Washmills Recycling Centre – Eastern Quarry, Watling Street, Bean, Dartford, Kent, DA2 2AB; and,
- Area A and Area C Material: Recycled Material Supplies Limited – Perry Road Recycling Facility, Perry Road, Dagenham, London, RM9 6QD;
- Area B: Keltbray Environmental Ltd – Plaistow Wharf, North Woolwich Road, London, E16 2AB;

Copies of the chemical testing certificates are provided in Appendix C (i) (Volume II). Details of the waste disposal are presented in Section 5.3.

Additional material from the site was disposed to the following facilities:

- Scrap Metal: EMR Southampton – 2 Princess Street, Southampton, SO14 5AP; and,
- General Waste: Westminster Waste Limited – Anderson Way, Belvedere, DA17 6BG.

3.7.3 Liquid Waste Disposal

Removal of perched water contained within the belowground former gasholder tank in Area B following a heavy rainfall event, and within the northern portion of Area C was attempted but unable to be removed due to low volumes within the excavation extents. The water within the

water treatment plant (WTP) pumped from Area B and C had only enough volume to collect a closed-loop sample. The collection of a closed loop sample was required to collect prior to discharged into Manhole 1401 Harwood Road located south of the site with Southern Water Services (which was not done due to low water volume). Copies of the chemical testing certificates from the closed-loop sample are provided in Appendix C (v) (Volume II). Copy of the Temporary Consent to Discharge Effluent is provided in Appendix B (iii) (Volume II).

Approximately 1,000kg of liquid (described as oily water) was removed offsite from the monoethylene glycol (MEG) Tank by a Gee Dee Plant vacuum tanker for disposal at O.W.S. in Hartlepool, TS25 2DF.

Sewage and grey water waste from site cabin facilities were collected by vacuum tanker by Tardis Environmental for disposal at the Uckfield Wastewater Treatment Works operated by Southern Water in East Sussex.

4. Enabling Works

Enabling works were undertaken in advance/during the remedial works on and comprised the following:

- Completion of a pre-works Condition Survey and completion of background monitoring;
- Completion of a topographic survey prior to the commencement of any intrusive works;
- Establishment of temporary dust and debris netting around the fenced perimeter of the site (unable to be completed due to extreme wind conditions on site);
- Site access/fencing access and egress arrangements;
- Service identification and protection;
- Confirm depth and location of existing below ground tank for remedial works;
- Topographic survey;
- Establishment of working areas;
- Establishment of monitoring points and background monitoring;
- Establishment of monitoring points (as required); and,
- Completion of one round of groundwater monitoring and sampling prior to commencement of any intrusive works and one round of groundwater monitoring and sampling during the intrusive works.

4.1 Trial Pitting

Trial pitting was undertaken using a 210 Excavator on 5 August 2025 and included the advancement of three trial trenches to depths of 1.3, 1.4 and 1.8 metres below ground (m bgl) in Areas A, B and C, respectively. The location of trial pits are presented on Appended Figure 4. A CAT & Genny were used to locate potential services surrounding the location of the trial pit locations prior to any intrusive works.

Trial trenching was undertaken in this phase of works to pre-test the export material to enable waste disposal facilities to be confirmed in advance of the remedial works. One soil sample was collected for chemical analysis from each Area to determine if the soil was hazardous.

Area A was deemed as non-hazardous soil, and Areas B and C were deemed hazardous soil. Soil was disposed of at appropriate disposal facilities as detailed in Section 5.3.

Chemical analysis of the initial trial pitting from each remediation area is included in Appendix C (i) (Volume II).

4.2 Asbestos Monitoring

Initial trial pitting and sample collection was completed in Areas A, B and C respectively to characterize material for off-site export prior to the start of remediation works on 5 August 2025. Asbestos was identified in the sample collected in Area A below detection limit at <0.001% for chrysotile. Asbestos was not detected in Area B or C. Because of the low asbestos concentrations from the characterization samples, Erith deemed asbestos monitoring not necessary during site remediation works.

4.3 Background Monitoring

Background monitoring including dust, noise, vibration and volatile organic compounds (VOCs) was undertaken on 15 and 30 July 2025. Further details of the monitoring carried out are included in Section 7.

4.4 Site Access & Security

The site was made secure by keeping the main access gate closed during works and by the erection of Heras fencing across the work areas. The Contractor followed the requirements set out in their Environmental Management Plan (EMP). The EMP covered the various aspects of vehicles and heavy plant movements during the works.

Pedestrian barriers were positioned in front of the welfare cabins and adjacent to the road to segregate vehicle traffic from the welfare area.

4.5 Service Identification & Protection

A PAS 128 survey on 30th July 2025 prior to mobilization to site to identify and locate underground services throughout the site. Erith liaised with SGN regarding the proposed works given the presence of the gas pipework located in the southern portion of the site adjacent and within Area A detailed below.

4.5.1 Gas

Erith liaised with SGN regarding working in proximity to previously identified gas pipework within and adjacent to Area A. Vacuum excavation pits were completed by J.A. Rattigan on the southeastern site boundary adjacent to Area A on 13th August 2025 to reveal and identify nine redundant below ground gas pipework services to ensure services were dead within Area A prior to excavation works. All redundant gas pipes were removed within Area A.

The location of identified pipes are indicated on Drawing 25-ECL-5639 in Appendix K(i) (Volume II).

4.5.2 Electric

An electrical isolation certificate dated 6th October 2020 was provided by SGN indicating the site is electrically isolated from DNO Supply as of 2nd September 2016 which is provided in Appendix B (iv) (Volume II).

A live electric cable running nearly parallel with the eastern boundary of the site was identified in the PAS 128 survey and located during excavation works. The cable was protected during excavation works and was covered with service sand and service marking tape prior to infilling. A copy of the PAS 128 survey is provided in Appendix K (i) (Volume II).

4.5.3 Telecommunications

A British Telecoms telecommunications cable and concrete box housing a cable connection identified in the PAS 128 survey were located within Area C during excavation works.

The status of the cable was not confirmed but presumed live. The material beneath the concrete cable housing box located in the south-eastern portion of the excavation was left in-situ to not compromise the cable connection's integrity and undermine the housing box. A copy of the PAS 128 survey is provided in Appendix K (i) (Volume II).

4.6 Condition Survey

A photographic condition survey was completed prior to the works commencing on-site. This survey was completed to establish the condition of the site and structures surrounding the site in particular; commercial premises to east and north, car park, residential properties, the operational electricity substation to the north of the site, the operational Cellnex telecoms compound with services crossing to the gasholder structure, the redundant above ground gasholder, live service location in the north and west of the site, palisade fencing surrounding the site, and the operational SGN gas governor compound to the south of the site.

A condition survey was conducted upon completion of the works. The survey was completed to be able to compare the pre/post-works condition of the site and determine if any deterioration of the site infrastructure occurred as a result of the works activities. The curb adjacent to the site access road in the eastern and north-eastern portion of the site was damaged and mostly removed due to excavator works within Area C. Additionally the curb in the western portion of the site was partially damaged from the tracks of the excavator.

The photographic record of the initial and subsequent condition surveys is included in Appendix A (i and ii) (Volume II).

4.7 Topographic survey

An initial topographic survey was undertaken by Erith prior to commencement of intrusive works to update the existing topographic survey data for the site. The initial topographic survey is included as drawing 25-ECL-5639 Utility and Topographical Survey in Appendix J (i) (Volume II).

Additional topographic surveys were completed to capture the excavation extents and final ground level post-works in drawings 13296-EXCAVATION-004 Excavation and Trial Pit Layout, and 13296-FGL-005 Asbuilt/FGL Survey, respectively, which are in Appendix J (ii) and (iii) (Volume II).

4.8 Establishment of working areas

The Contractor's temporary site compounds were established throughout the site where required. The main welfare and office buildings were established along the central and northern western site boundary.

Working areas, comprising excavation areas, stockpiling areas and processing areas were fenced with "Heras" style mesh fencing during the remediation works, secured at the end of each shift.

4.9 Establishment of stockpile areas

Stockpiling of excavated materials was undertaken on site in designated stockpiling locations. Excavated materials were stockpiled whilst awaiting characterisation/classification sample results to determine its fate.

Contaminated or potentially contaminated stockpiles were situated on areas within remaining remediation areas.

4.10 Ecological protection

Due to the proximity of the River Arun, a Preliminary Ecology Survey was conducted in October 2024 by CT Ecology. The Ecological Survey noted in relation the Biodiversity Net Gan (BNG) that the works will impact less than 25m^2 of semi-natural habitats and under current guidance, the 'de minimis' exemption can be applied to the site and therefore, not require a BNG assessment to facilitate the works. Due to ecological enhance measures not being feasible at this stage, it was suggested enhancement measures be incorporated into any future redevelopment at the site to ensure there is a net gain in biodiversity in the long term.

As specified by prior ecology surveys, CT Ecology Limited was commissioned to monitor the potential presence of peregrine falcons prior to site works between May and July 2025, which have been monitored annually since 2022.

It was determined there were no nesting peregrine falcons at the site, but it is recommended that a pre-works check of working area be undertaken immediately prior to works. Additional peregrine falcon monitoring and nesting bird checks were recommended if subsequent phases of the works at the site commence during the 2026 nesting season. The Ecologist's report is included in Appendix G (iii).

5. Remediation Works

This section of the report documents the main earthworks that were undertaken at the site during the works and should be read in conjunction with the drawing 13296-EXCAVATION-004 Excavation included in Appendix J (ii) (Volume II)).

Earthworks were undertaken between 12 August and 3 October 2025.

Receipt and approval of the analytical data for the import material (Type 1, 6F5 and clay), and confirmation of landfill for the export material were completed.

Following mobilisation to site suitable hygiene and decontamination facilities were provided for use at the site including a twin-shower decontamination, a canteen unit with office and toilet block.

Whilst working in the respective remedial areas, workers were required to pass through the decontamination facility to enter and exit the 'dirty' area of the Remediation Areas A and B. Personal Protective Equipment (PPE) was worn throughout the site by workers and visitors.

Wagons removing potentially contaminated material from site employed a self-sheeting system.

5.1 Excavation Works

The excavation work was undertaken between 4 August and 3 October 2025 and within the hours of 08:00 and 18:00.

A Hitachi Zaxis tracked 210 excavator (20 tonne) was used to excavate Areas A, B and C which was considered appropriate for the scale of the site and works and followed the design set out in the PWI (Worley Consulting, 2025), and the requirements of the SGN Specification for Gasholder Tank Dewatering, Infilling and Reporting Specification, Version 3.3 (SGN, 2019).

Soils within the plateau of Remediation Area A were reduced by approximately 0.40 m in the north and to 1.00 m in the south and dispatched off-site to Recycled Material Supplies Limited, Perry Road Recycling Facility, Dagenham, London, RM9 6QD. Soils in Area B and C were excavated to 1.30 m bgl and 2.5 m bgl, respectively. Soil from Remediation Area B and C were classified as hazardous, deposited directly into Erith's waiting lorries and dispatched for off-site disposal at Keltbray Environmental Ltd, Plaistow Wharf, North Woolwich Road, London, E16 2AB for Area B soils and Recycled Material Supplies Limited, Perry Road Recycling Facility, Dagenham, London, RM9 6QD for Area C soils, respectively.

Prior to the commencement of the works, the extent of the excavations were set out by a surveyor from Erith. During the excavation works, further regular visits were undertaken by the surveyor to ensure the correct excavation depth had been achieved across the remedial areas.

Table 5 below provides a summary of the planned and actual volumes of excavated material arising from the excavation areas.

Table 5 Summary of Excavation Volumes from Site

Remedial Area	Planned Surface Area (m^2)	Approximate Surface Area Removed (m^2)	Planned Volume to be Removed (m^3)	Approximate Volume Removed (m^3)
Area A	510.50	467.87	412.00	365.68
Area B	126.70	126.70	206.6	323.18
Area C	107.00	127.42	249.00	317.65
Total	**744.2**	**721.93**	**869.6**	**1,006.51**

* *based on topographical survey and data provided by Erith*

5.1.1 Area A – Raised Plateau

The MEG tank atop Area A was emptied via a vacuum tanker 13 August 2025. Miscellaneous concrete and fiberglass gas caps were removed from Area A and stockpiled for off-site removal on 12 August 2025. Seven vacuum excavation pits were completed by J.A. Rattigan on the southeastern site boundary adjacent to Area A on 13 August 2025 to reveal and identify nine redundant below ground gas pipework services to ensure services were dead within Area A prior to excavation works. Removal of asphalt atop Area A and the MEG tank commenced 18 August 2025, followed by excavation from 19 August 2025 using a 210 excavator. After commencement of excavation, concrete and redundant gas services were located throughout Area A, removed and sorted into stockpiles for off-site disposal. The excavation progressed west to east and was completed on 29 August 2025 with continued off-site removal of material until 5 September 2025.

A Project Manager's Instruction (PMI) was produced in relation to a change in the proposed works associated with Area A. It was requested that following the removal of the above ground plateau structure, Erith re-grade the resultant surface to provide a more level final finished surface which was completed on 8 September 2025.

A total of 365.68 tonnes of soil from Area A was excavated and sent for offsite disposal to Recycling Material Supplies Limited Perry Road Recycling Facility, Perry Road, Dagenham, London, RM9 6QD.

5.1.2 Area B – Below Ground Former Gasholder Tank

Excavation works in Area B was undertaken by Erith using a mechanical excavator between 1 and 10 September 2025 with concurrent disposal of material throughout excavation works. The excavation was advanced to a maximum depth of approximately 1.3 m bgl to the base of the below ground gasholder which is 12.78m in diameter.

Two pockets of tar were observed to be leaching through the made ground adjacent to the locally broken-down cast-iron tank wall. A PMI was issued and instructed the steel tank structure of the below ground gasholder in Area B would remain in-situ (opposing the initial design for the tank walls and base to be removed). Therefore, the steel metal base and tank walls were retained and remained in-situ.

A total of 323.18 tonnes from Area B was excavated and sent for offsite disposal to the licensed soil treatment facility Keltbray Environmental Ltd, Plaistow Wharf, North Woolwich Road, London, E16 2AB.

5.1.3 Area C – Made Ground/NAPL Associated with the Former Retort House

Excavation works were undertaken by Erith using a mechanical excavator between 17 September to 3 October 2025. Excavations commenced in the northern and eastern boundaries to 2.5 m bgl, with validation samples collected from the excavation extents, and then with a 1m wide clay capping wall. It should be noted services and a concrete box housing cables was encountered in the excavation boundary, therefore preventing excavation below the cable box to avoid undermining the structure.

Following the installation of the clay capping walls in the northern and eastern boundaries, excavation works commenced within the main works area. Excavation to 2.0 m bgl was achieved within the northern portion of the excavation, while the excavation in the southern portion was to 1.8m bgl due to no visual or olfactory impacts noted within the natural clay with the exception of material beneath the concrete cable housing box detailed in Section 4.5.3 which remained in-situ. Perched water/groundwater was present within the base of the excavation (approximately 0.2m depth above excavation base. Efforts were made to dewater the excavation but were unsuccessful due to the proximity of the water treatment plant and low water volume. It was determined there was insufficient water present and decided that 0.2m of 6A material was not required to be placed in the base of the excavation.

Following excavation works, 1.9m of 6F5 material was placed in the excavation and capped with 0.1m of Type 1 material in the main excavation extents. Due to the clay capping walls being inset approximately 1m from the northern and eastern boundaries to avoid undermining the boundary fence, the remaining surface material between the clay capping walls and boundary fence had a 300mm scrape completed and capped with clay.

A total of 317.65 tonnes of material from the site was excavated and was sent for offsite treatment/disposal to Recycled Material Supplies Limited as detailed in Section 5.3.2 below.

5.2 Stockpile Management

During the works soils from the Remediation Areas were excavated and situated on areas within remaining remediation areas.

5.3 Waste Disposal

5.3.1 Haulage

Licensed hauliers (Erith Haulage Company Limited, Recycled Material Supplies Limited, Eurogreen Environmental Ltd, European Metal Recycling Limited, Hoare Construction Group Limited) were used for the transportation of waste materials from site. Copies of hauliers waste haulage licences are included in Appendix E (i) (Volume II). The hauliers employed for the transfer of contaminated soils from site made sure to cover their loads before exiting the site using a self-sheeting mechanism. Copies of all waste transfer notes are included in Appendix E (iii) (Volume II).

5.3.2 Solid Waste

The Contractor classified material from the remedial areas for off-site disposal from representative samples collected when required during the enabling works. Chemical data required for Areas A, B, C and stockpiles A and B was assessed by the Contractor and issued to the nominated waste facilities prior to being disposed of from the site. Details of the waste receivers are included in Appendix E (ii) (Volume II). A summary of the solid waste disposal details are provided in Table 6 below.

Table 6 Summary of Solid Waste Disposal Details

Area/Material	Waste Carrier	Disposal Destination	Waste Classification/ Waste Code	Tonnage
Area A Material	Erith Haulage Company Limited – Erith House, 7 Queen Street, Erith, DA8 1RP Recycled Material Supplies Limited – Sunshine Wharf, Bradfield Road, West Silvertown, London E16 2AX.	Recycled Material Supplies Limited – Perry Road Recycling Facility, Perry Road, Dagenham, London, RM9 6QD.	17.05.04	365.68
Area B Material	Erith Haulage Company Limited – Erith House, 7 Queen Street, Erith, DA8 1RP.	Keltbray Environmental Ltd – Plaistow Wharf, North Woolwich Road, London, E16 2AB.	17.05.03	323.18
Area C Material	Erith Haulage Company Limited – Erith House, 7 Queen Street, Erith, DA8 1RP.	Recycled Material Supplies Limited – Perry Road Recycling Facility, Perry Road,	17.05.03	317.65

Area/Material	Waste Carrier	Disposal Destination	Waste Classification/ Waste Code	Tonnage
		Dagenham, London, RM9 6QD.		
Remediation Area A Concrete, Stockpiles A and B	Erith Haulage Company Limited – Erith House, 7 Queen Street, Erith, DA8 1RP. Eurogreen Environmental Ltd – North Barn Farm, Titnore Land, Worthing, BN12 6NZ.	Washmills Recycling Centre – Eastern Quarry, Watling Street, Bean, Dartford, Kent, DA2 8AH. Eurogreen Environmental Ltd – North Barn Farm, Titnore Land, Worthing, BN12 6NZ.	17.01.01	64
Tarmacadam (Area A)	Erith Haulage Company Limited – Erith House, 7 Queen Street, Erith, DA8 1RP.	NRS Meriden Aggregates Ltd – Cornets End Land Recylcing Facility, Meriden Depot, Coventry, CV7 7LG.	17.03.01	20
Scrap Metal (from MEG tank, Area A, Area B and stairs removed from gasholder)	European Metal Recycling Limited – Sirius House, Delta Crescent, Westbrook, Warrington, WA5 7NS.	EMR Southampton – 2 Princess Street, Southampton, SO14 5AP.	20.01.40 17.04.07	55.52
General Waste	Hoarse Construction Group Limited – Hangar 3, Rudford Industrial Estate, Ford, BN180BD.	Westminster Waste Limited – Anderson Way, Belvedere, DA17 6BG.	20.03.01	31.20
			Total	1,177.23

5.3.3 Liquid Waste

A closed-loop sample of the water within the WTP was obtained by the Contractor. The analytical data was assessed by the Contractor deemed acceptable to discharge to foul sewer Manhole 1401 (although not enough volume was present within the WTP to discharge). Details of the closed-loop chemical analysis is included in Appendix C (v) (Volume II).

Details of the waste receivers are included in Appendix E (ii) (Volume II). A summary of the liquid waste disposal details is provided in Table 7 below.

Table 7 Summary of Liquid Waste Disposal Details

Remedial Area	Waste Carrier	Disposal Destination	Waste Code	Weight/Volume
MEG Tank Liquid	Gee Dee Plant – Unit 1, Graythorp Industrial Estate, Hartlepool, TS25 2DF.	O.W.S. – Unit 1, Graythorpe Industrial Estate, Hartlepool, TS25 2DF.	13.05.07	1,000 kg
Shallow Groundwater (Area B and C)	n/a	Manhole 1401	n/a	n/a
Sewage and Grey Water	Tardis Environmental UK Limited – Site 4, Halesfield 21, Telford, TF7 4PA.	Southern Water Services Limited – High Street, Uckfield, East Sussex, TN22 5DL.	20.03.04	5,829.17 gallons

5.3.4 Site Progress Record

A photographic record of site progress was maintained throughout the works. A selection of the photographs taken by the Supervisor is included in Appendix I (Volume II).

5.4 Reinstatement Works

Details of the final site condition and level are shown on Drawing 13296-FGL-005 in Appendix J (iii) (Volume II).

Reinstatement works were undertaken between the 11 September and 6 October 2025, which comprised Areas A, B and C.

Area A:

- Placement and compaction of 0.6 m thickness;
- Placement of geotextile membrane; and,
- Placement and compaction of 150 mm (0.15 m) thickness of Type 1 atop the geotextile membrane with in-situ plate load tests undertaken at final formation level.

Area B

- Placement and compaction of 1.15 m thickness of Type 6F5 with in-situ plate load tests undertaken at 0.8 m;
- A geotextile layer was placed at atop the 6F5 material; and,
- Placement and compaction of 150 mm (0.15 m) thickness of Type 1 with additional plate load tests and dry density tests undertaken the top formation level.

Area C

- Placement of 1.9 m thickness of imported 6F5 material with in-situ plate load tests undertaken at 1.5 m;
- A geotextile layer was placed at atop the 6F5 material;
- Placement and compaction of 100mm thickness of Type 1 material, flush with existing ground level with in-situ plate load and dry density tests undertaken at the top formation level; and,
- Placement of a 1 m wide and 2.5 m deep clay cut off wall using Class 7J (clay) material along the northern and eastern boundary (22.5 linear meters).

The volumes of imported Type 1, 6F5 and Class 7J (clay) material for the site are 378 tonnes, 180 tonnes and 144 tonnes, respectively, with import tickets included in Appendix F (i), (ii) and (iii) (Volume II).

It should be noted that due to low volumes of water infiltration within the excavation of Area C, Erith determined 6A material was not required to be placed within the excavation extents.

5.4.1 Reinstatement Methods

Excavations were backfilled with acceptable earthworks materials imported to site (details in section 5.4.

Prior to capping with Type 1, a woven geotextile separating/marker layer was placed above the class 6F5 fill following levelling and compaction within the remediation areas.

All earthworks materials were placed and compacted following appropriate method compaction specification for material classes specified in SGNs Specification for Gasholder Tank Dewatering, Infilling and Reporting, Version 3.3 (SGN, 2019). Generally, 1.2m wide twin drum vibratory rollers (Bomag 120) was used for compaction. Material was placed in 100 or 150mm layers and compacted with the required no. passes according to SGN Specification, contained in Appendix L (i) (Volume II).

5.4.2 Fill Material Volumes

Summary of fill materials used is provided in Table 8 below:

Table 8 Summary of Fill Materials

Contractor	Material	Source	Quantity (t)	Summary of Final Use
Eurogreen	6F5 (recycled aggregate)	Eurogreen Environmental Ltd – North Barn Farm, Titnore Lane, Worthing, BN12 6NZ	378	Fill
TJ Transport	Type-1 (primary quarried aggregate)	JayFlex (Aggregates) – Horton Brook Quarry, Horton, Slough, Buckinghamshire, SL3 0LP	179.64	Capping Layer
MV Haulage	7J (primary quarried clay)	TL Transport – J Charity Farm, 127 Wickham Road, Fareham, PO17 5BP	144	Clay cap wall
		Total import	701.64	

5.5 Monitoring Well Decommissioning

On 9th and 22nd of September, respectively, groundwater monitoring well MW23-06D (Area B) and vapour monitoring well VW23-03 (Area C) were removed due to their installation depth being shallower than the excavation extents. On 19th and 22nd September, respectively, groundwater monitoring wells WS07 and MW24-01 were decommissioned.

To decommission wells, bentonite pellets were poured into the wells to ground level. The pipe was then cut down to excavation level.

5.6 Gas Covers

No gas covers were encountered during excavation works in Remediation Areas A, B or C.

Seven vacuum excavation pits were completed by J.A. Rattigan on 13 August 2025 to identify nine below ground gas services at the southern site boundary, adjacent to the south of Remediation Area A prior to excavation works. No live services in Remediation Area A were identified, and all redundant gas pipes were removed.

6. Verification

6.1 Verification of Excavation Extents

No verification samples were required for Area A and B.

6.1.1 Verification of Remediation Area C

As discussed in section 5.1.3, during the remediation excavation works in Area C, eleven soil samples (including one duplicate) were collected from the batter and base of Remediation Area C. Soil samples were collected from 5 no. exposed excavation batters side walls of the excavation area, 1 no. from the southern and northern portion of the excavation base, respectively, and 2 no. from the clay cut-off wall excavation works in the northern and eastern excavation boundary, respectively. During the verification sampling, pockets of tarry liquid with sheen were found throughout the samples collected in the northern boundary prior to infilling with the clay wall. The remaining verification samples from excavation extents, including base samples did not note observations of significant or gross contamination. It was noted that an off-site electrical substation adjacent to the northern boundary of Area C had leaked a significant amount of liquid with staining observed on the concrete base and surrounding gravels.

The verification samples collected from Area C were for information purposes only and therefore were not screened against any assessment criteria. Soil validation sample locations are presented on Appended Figure 4 with chemical results included in Appendix C (iii) (Volume II).

Import material placed within Area C was screened against screening criteria which is discussed in Section 6.2.

The remediation works undertaken and documented here are considered to have removed gross contamination associated with the targeted area, thereby contributing to environmental betterment via reducing potential contaminant loading to groundwater.

Additionally, the installation of the clay cut off wall will prevent potential re-contaminating of the remediated area from up hydraulic gradient contaminant sources (e.g. off-site former gasworks).

6.2 Chemical Verification of Imported Material

Import materials were sourced from the following locations:

- Type 1: TL Transport, J Charity Farm, 127 Wickham Road, Fareham, PO17 5BP;
- 6F5: Eurogreen Environmental Ltd, North Barn Farm, Titnore Lane, Worthing, BN12 6NZ; and,
- Clay: Jayflex (Aggregates), Horton Brook Quarry, Horton, Slough, Buckinghamshire, SL3 0LP.

A Quantitative Risk Assessment (QRA) for the site has been completed to derive target remedial criteria protective of controlled waters relevant to the proposed import material.

Generic Assessment Criteria for Human Health suitable for a commercial land use scenario (based on 1 % soil organic matter) are proposed as the target remedial criteria for proposed import material. Generic Assessment Criteria have been derived using the CLEA v.1.071 model and represent a minimal/ negligible risk level.

As the environmental standards for certain modelled compounds are extremely low, in some instances, the remediation criteria are likely to be below the limit of detection (LOD) for the analytical techniques used to assess the soil/material samples. Should this scenario arise, the LOD shall be used as the remediation criteria.

The criteria are considered to be protective of controlled waters (leachate) and human health (soils) and are considered appropriate to ensure protection of the identified receptors for both current and potential future use. The QRA can be found in the PWI (Worley Consulting, 2025).

Soil chemical analysis results for the import materials were submitted to the Supervisor for review to confirm suitability. Three samples of the imported Type 1, 6F5 and clay material were submitted for analytical analysis. The laboratory test certificates are presented in Appendix C (Volume II). The results are presented as Tables 1 and 2 and were screened against the import assessment criteria for soils and leachate outlined below in Table I and Table J. The results of the analysis for each material type are discussed in Sections 6.2.2, 6.2.3 and 6.2.4, respectively.

6.2.1 Soil and Leachate Assessment Criteria

Soil and leachate assessment criteria applicable to the works are provided in Table 9 and Table 10 below. These criteria were adopted as suitable targets for import materials outlined in the PWI (Worley Consulting, 2025).

Table 9 Soil Assessment Criteria (Import)

Determinand	Commercial Soil Criteria ($mg.kg^{-1}$)
Unionised ammonia as N	0.5
Cadmium	0.2
Chromium (III)	366
Copper	1
Cyanide	1
Iron	61.10
Napthalene^	0.324
Nickel	39.30
Aresenic	12.5

Determinand	Commercial Soil Criteria ($mg.kg^{-1}$)
Benzene^	0.005
Benzo(a)pyrene	0.00013
Chromium (VI)	2.88
Ethylbenzene^	0.054
Lead	20.60
Mercury	0.3
Toluene^	0.0051
Xylenes^	0.0088

^ Denotes volatile organic compounds

Table 10 Leachate Assessment Criteria (Import)

Determinand	Leachate Criteria ($mg.L^{-1}$)
Unionised ammonia as N	0.0713
Cadmium	0.000244
Chromium (III)	0.076
Copper	0.00916
Cyanide	0.01
Iron	2.44
Napthalene^	0.0844
Nickel	0.0313
Aresenic	0.025
Benzene^	0.001
Benzo(a)pyrene	0.00001
Chromium (VI)	0.005
Ethylbenzene^	0.02
Lead	0.0013
Mercury	0.0005
Toluene^	0.004
Xylenes^	0.003

^ Denotes volatile organic compounds

6.2.2 Type 1- Chemical Analysis

The Type 1 material comprised a quarried gravel. For reference, samples are referenced as TJ Type 1 Import - 01 to TJ Type 1 Import - 03 on the laboratory reports.

Findings from the screening of the soil and leachate chemical results for the Type 1 material, against the applied import criteria are as follows:

- Measured soil exceedances were observed in one sample for cadmium, two samples for arsenic, and all three samples for copper and lead. It should be noted, copper exceedances were observed all import samples, which potentially suggests there are naturally elevated levels of copper concentrations in the surrounding area. The exceedances were of the same magnitude as the applied import criteria, and as such, the measured concentrations are not considered to pose a risk to controlled waters; and,

- Chromium (hexavalent) and benzo(a)pyrene concentrations for leachate were below the laboratory limit of detection; however the applied import leachate criterion was lower than the laboratory limit of detection. As stated in Section 6.2., if the remediation criteria is below LOD, the LOD shall be used as the remediation criteria. Therefore, measured concentrations in leachate were recorded at the laboratory limit of detection and orders of magnitude below the applied import soil criteria presented in Table J.

Given the above the measured soil and leachate concentrations recorded indicated the import Type 1 material was chemically suitable as import material.

Copies of the laboratory reports for the chemical results are included in Appendix C (ii) (Volume II).

6.2.3 6F5 – Chemical Analysis

The 6F5 comprised of recycled aggregate gravel. For reference samples are referenced as Import 6F5-04 to Import 6F5-06 on the laboratory reports.

Findings from the screening of the soil and leachate results for the recycled aggregate, against the applied import criteria are as follows:

- Measured soil exceedances were observed in two samples for benzo(a)pyrene, and all three samples for copper. It should be noted, copper exceedances were observed all import samples, which potentially suggests there are naturally elevated levels of copper concentrations in the surrounding area. The exceedances were of the same magnitude as the applied import criteria, and as such, the measured concentrations are not considered to pose a risk to controlled waters; and,

- Chromium (hexavalent) and benzo(a)pyrene concentrations for leachate were below the laboratory limit of detection; however the applied import leachate criterion was lower than the laboratory limit of detection. As stated in Section 6.2., if the remediation criteria is below LOD, the LOD shall be used as the remediation criteria. Therefore, measured concentrations in leachate were recorded at the laboratory limit of detection and orders of magnitude below the applied import soil criteria presented in Table J.

Given the above the measured soil and leachate concentrations recorded indicated that the imported angular aggregate was chemically suitable as import material.

Copies of the laboratory reports for the chemical results are included in Appendix C (ii) (Volume II).

6.2.4 Clay – Chemical Analysis

The clay is quarried clay. For reference samples are referenced as Import Clay-01 to Import Clay-03 on the laboratory reports.

Findings from the screening of the soil and leachate results for the clay, against the applied import criteria are as follows:

- Soil exceedances were observed for copper in all three samples. It should be noted, copper exceedances were observed all import samples, which potentially suggests there are naturally elevated levels of copper concentrations in the surrounding area. The exceedances were of the same magnitude as the applied import criteria, and as such, the measured concentrations are not considered to pose a risk to controlled waters; and,
- Chromium (hexavalent) and benzo(a)pyrene concentrations for leachate were below the laboratory limit of detection; however the applied import leachate criterion was lower than the laboratory limit of detection. As stated in Section 6.2., if the remediation criteria is below LOD, the LOD shall be used as the remediation criteria. Therefore, measured concentrations in leachate were recorded at the laboratory limit of detection and orders of magnitude below the applied import soil criteria presented in Table J.

Given the above the measured soil and leachate concentrations recorded indicated that the imported angular aggregate was chemically suitable as import material.

Copies of the laboratory reports for the chemical results are included in Appendix C (ii) (Volume II).

6.2.5 Quality Assessment

Duplicate samples were collected as an assessment of sampling and laboratory precision for quality assurance and quality control (QA/QC) associated with the soil and groundwater samples collected throughout the site. Copies of the laboratory reports for the chemical results of the parent and the duplicate samples are included in Appendix C (iv) (Volume II). For reference, the parent and duplicate soil and leachate samples collected from site are referenced as 'B1 South Wall' and 'B1 South Wall D', 'TP1' and 'TP1-D', on the laboratory reports, respectively.

For reference, the parents and duplicate groundwater samples collected from site are referenced as;

- August 2025 (Pre-works monitoring round): 'MW23-04' and 'DUP-1', and 'MW23-03' and 'DUP-2'

- September 2025 (Monitoring round during remediation works): 'MW23-03' and 'DUP-1', and 'MW23-01' and 'DUP-2'
- October 2025 (First post-works monitoring round): 'WS04' and 'DUP-1'
- December 2025 (Second post-works monitoring round): 'WS04' and 'DUP-1'
- February 2026 (Third and final post-works monitoring round): 'MW23-03' and 'DUP-1'

An assessment of duplicate variation was carried out as an assessment of sampling and laboratory precision. For comparison between duplicates, a calculation of relative percentage difference (RPD) was carried out. For this assessment, RPD is defined as the difference over average for duplicates. Contaminants with an RPD greater than 30% are flagged.

The RPDs for all determinants were within an acceptable range of accuracy and are presented as Tables 3 and 4.

RPDs within the duplicate soil results were generally considered to be within a reasonable degree of variance (<30%). Greater variances were identified in organics: cyanide, sulphide, organic matter and PAHs within B1-South Wall and B1-South Wall D; and chromium, nickel, lead and organic matter within TP1 and TP1-D. Greater variances of PAHs within B1-South Wall at the excavation base are likely due to mild contamination noted within the area. No visual or olfactory contamination was noted within either soil sample. The laboratory data has been reviewed, with no deviations noted within the reports, suggesting that differences within the reported parameters are due to the soils and, contaminants within, being heterogeneous.

RPDs within the duplicate groundwater results were generally considered to be within a reasonable degree of variance (<30%) with some minor exceptions. Within inorganics analysed, the RPD was exceeded for electrical conductivity, chloride, total suspended solids, arsenic, chromium, copper, nickel, zinc and iron. Recorded RPDs were between 30.5% - 190%. As the majority of recordable concentrations for these are below 0.2 $mg.L^{-1}$, a relatively small change in value results in a high RPD value.

Four groundwater 'trip blanks' were analysed for each monitoring round with concentrations generally being below the limit of detection (with the exception of sulphate, chloride, ammoniacal nitrogen, total organic carbon, copper and iron). It should be noted the trip blank analysed for the October monitoring round had minor exceedances of metals which the laboratory indicated is not unexpected as the deionised water they utilize often have levels above the limit of detection.

Soil and groundwater chemical data generally correlated with observed field conditions.

It is considered that the soil and groundwater chemical data is fit for purpose

6.3 Validation Samples

Eleven soil samples (including one duplicate) were collected from the batter and base of Remediation Area C at excavation level, on a 10 by 10 m grid. These samples were collected for information only and therefore were not screened against any assessment criteria. Soil

validation sample locations are presented on Appended Figure 4 with chemical results included in Appendix C (iii) (Volume II).

6.4 Geotechnical Verification of Import Materials

Three samples each of the Type 1, Class 6F5 and Class 7J (clay) material were tested for their geotechnical properties as set out in the PWI (Worley Consulting, 2025).

The results are included in Appendix D (i) (Volume II).

6.5 Compaction and Verification

The imported 6F5 and Type 1 was placed and compacted in accordance with the SGN Specification for Gasholder Tank Dewatering, Infilling and Reporting Specification, Version 3.3 (SGN, 2019).

In-situ geotechnical testing locations are shown on Drawing 13296-FGL-005 included in Appendix J (iii) (Volume II).

6.5.1 Plate Bearing Tests

Plate bearing tests were undertaken on final formation level of Remediation Areas A, B and C on 29th September 2025 by Construction Testing Solutions using the tracked excavator (20t) as kentledge. All tests on the final formation met the required compaction verification specification of 110KPa with maximum 25mm settlement (for plate bearing tests) and had 95% (minimum) CBR value at final formation levels for each area.

Results from plate bearing tests undertaken on excavation formation and final formation are included in Appendix D (ii) (Volume II).

7. Environmental Monitoring

Monitoring for noise, vibration, dust, vapour and odour was undertaken daily by Erith.

Information on the location of monitoring stations, monitoring equipment used, and data collected are presented in Appendix G (i) (Volume II).

7.1 Noise

Noise was monitored in decibels (dB) during the works at the southern site boundary nearest to the residential receptors. It is established that there is no fixed level of noise which constitutes a statutory nuisance. However, in accordance with the British Standard '*Code of Practice for Noise and Vibration Control on Construction and Open Sites*' (5228-1:2009+A1:2014) a guidance value was adopted, as noise can have a potential significant effect on dwellings surround construction sites.

Background monitoring was undertaken on 15 and 30 July 2025, where a mean background level of 55 dB and 60 dB was calculated, respectively. The lower and upper exposure action values was a daily or weekly exposure of 70 dB and 75 dB, respectively, with a peak sound pressure of 130 dB and 135 dB, respectively. This threshold reflected assessment criteria for 'daytime', hours between 0800 and 1800, and the receptor an adjacent dwelling.

No noise exceedances were recorded during the works.

7.2 Vibration

A Turnkey iVIBE data logger and 3 axis geophone was used for vibration monitoring for the duration of the works at the southern boundary of the site boundary nearest to the residential receptors during the first seven weeks of the project, which was then moved to the northern boundary of the site nearest to the commercial building during works in Remediation Area C. Maximum limits for vibration are based upon guidance given in '*Evaluation and Measurement for Vibration in Buildings — Part 2: Guide to Damage Levels from Ground Borne Vibration*' (BS 7385-2: 1993). The acceptable maximum limits for vibration at the receptor is 5 mm/s.

No vibration exceedances were recorded during the works.

7.3 Dust

7.3.1 Frisbee Monitoring Stations

Four 'frisbee-type' deposition gauge as well as directional 'sticky pads' were used to confirm that the Contractor was managing dust in accordance with best practice. Monitoring stations were positioned on-site from 4 August until 3 October 2025 and located in the following locations:

- Adjacent to the east of the main access gate;
- Adjacent to the north of the on-site canteen and office;

- Adjacent to the south-western site boundary near Area A (nearest to the residential receptors); and,
- Adjacent to the eastern boundary of the site.

The compliance level for total suspended particles was 200 mg/m^2/day. During the works total dust deposition was measured between <18 (laboratory limit of detection) – 36 mg/m^2/day. No dust exceedances were recorded during the works.

Copies of the laboratory dust results are included in Appendix G (ii) (Volume II).

7.3.2 Dynamic Dust Monitoring

An Osiris air monitor uses a light-scattering laser photometer to measure airborne particle monitors in real-time which was set-up south-west of the aboveground gasholder adjacent to the south of the canteen and office. Action values for personal exposure to dust are based upon guidance given in '*Institute of Air Quality Management (2018), Guidance on Air Quality Monitoring in the Vicinity of Demolition and construction Sites)*. Action values for personal exposure to Dust for Particule Matter PM10 are set to a lower action level of 180 ug/m3 averaged over a 15-minute period as Erith's.

No dynamic dust exceedances were recorded during the works or reached 180 ug/m3.

7.4 Vapour

Both an Ion Science Tiger Select, utilized for detection of benzene and total aromatic compounds (TAC), and an Ion Science Cub, Photo Ionising Detector (PID), utilized to log data and have an audio/visual alarm in response to any exceedances of the occupationa guideline value or appropriate organic contaminants were utilized to monitor vapour throughout the works. Action values for personal exposure to volatile organic compounds (VOCs) (calibrated to benzene standard) were set to 1 part per million (ppm).

No vapour exceedances were recorded during the works.

Vapour monitoring was not undertaken during the final week of works (29 September to 3 October 2025) as excavation works were complete.

7.5 Daily Monitoring

Monitoring for dust, odour, and noise and vibration was undertaken daily outside the boundary of the site, with action levels based on 1 – 4 (1 – no dust/odour/noise, to 4 – extremely strong). If nuisance dust, odour and/or noise were observed, the site manager was to be informed and extra mitigation was to be employed.

Dust was monitored visually and recorded action level 1 for the duration of the works.

Odour action levels all measured 1, except 13th August 2025 at 7:30am, which recorded action level 2 for the southern and western boundaries which indicated a tarmac smell recorded off-site related to vacuum excavation works.

Noise action levels all measured 1, except 13th August 2025 at 11:30am, which recorded action level 2 for the southern and eastern boundaries (recorded to be associated with vacuum excavation works) and 26th August 2025 at 8:00am and 11:20am at the western boundary, respectively which recorded action level 2 was most likely associated with the breakout of concrete at in Area A.

It should be noted that no complaints were received regarding action level 2 observations recorded for the aforementioned days, and no exceedances of dust and noise equipment were recorded for the duration of the works.

Copies of the daily logs are included in Appendix G (i) (Volume II).

7.6 Asbestos Monitoring

Erith deemed airborne asbestos monitoring as unnecessary during site remediation works as described in Section 4.2.

8. Groundwater Monitoring

As part of the planning application for the remedial works, a groundwater monitoring plan was developed and provided to the Local Authority to satisfy the following conditions.

- **Condition Number 3:** *Prior to any part of the development hereby approved being considered complete a verification report demonstrating the completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to, and approved in writing, by the Local Planning Authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. Where necessary, the report shall also include long-term monitoring and maintenance plans and arrangements for contingency action. Note: Any changes to these components require the express written consent of the Local Planning Authority.*

  Reason: To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with the Arun Local Plan policies QE SP1 and QE DM4."

- **Condition Number 5:** *"Prior to the commencement of the development hereby permitted, a groundwater monitoring and maintenance plan in respect of contamination, including a timetable of monitoring and submission of reports to the Local Planning Authority, has been submitted to, and approved in writing by, the Local Planning Authority. Reports as specified in the approved plan, including details of any necessary contingency action arising from the monitoring, shall be submitted to, and approved in writing by, the Local Planning Authority.*

  Reason: To ensure that the site does not pose any further risk to the water environment by managing any ongoing contamination issues and completing all necessary long-term remediation measures, and ensuring the proposed works do not further mobilise contaminants in the interests of protection of the environment and prevention of harm to human health in accordance with the Arun Local Plan policies QE SP1 and QE DM4 and paragraph 187 of the National Planning Policy Framework."

In line with the proposed monitoring plan (Worley Consulting, 2025b), five groundwater monitoring rounds were undertaken at the site in 2025. One monitoring round was completed prior to remediation works (August 2025) and one was completed during remediation works (September 2025). Following the completion of remediation works at the site, three groundwater monitoring rounds were completed post-works every two months in October 2025, December 2025, and February 2026, respectively. The groundwater monitoring has been used to supplement the two monitoring rounds undertaken at the site by Worley Consulting (formerly Advisian) in 2023.

Groundwater depth was measured at the monitoring point using an oil interface probe. The probe was also used to check for the presence of light non aqueous phase liquid (LNAPL) or dense non aqueous phase liquid (DNAPL). Appended Table 5 presents the groundwater depth and elevation data obtained during the 2025/2026 monitoring rounds.

The wells were sampled using low-flow techniques. Prior to sampling, the water parameters were monitored within the well to establish a stable well field. Once the readings were stable for three consecutive readings (over a minimum period of three minutes) sampling was undertaken. A YSI Pro Quatro Water Quality Meter was used to record in-situ field data which included pH, redox, dissolved oxygen, and conductivity.

Groundwater field parameter data from 2025/2026 and 2023 are included in Appended Tables 6 and 7, respectively.

Groundwater monitoring wells at the site, which formed part of the groundwater monitoring programme, are presented in Table 11. Groundwater monitoring data has not been reviewed in detail for wells which were decommissioned during the works (MW23-06D, MW24-01 and WS07).

Table 11 Groundwater Monitoring Wells

Well ID	Screened Lithology	Location
MW01	Chalk	Located in the south-west of the site, cross hydraulic gradient of Remediation Areas A and B. Located down hydraulic gradient of Area C and above ground Gasholder.
MW02	Chalk	Located in the west of the site, cross hydraulic gradient of Remediation Areas A, B and C.
MW03	Chalk	Located on the north-eastern site boundary, cross hydraulic gradient of Area C and up hydraulic gradient from Area A and Area B.
MW23-01	Chalk	Located in the south of the site, down hydraulic gradient of Areas A and C and the above ground gasholder. Cross hydraulic gradient (south-west) of Area B.
MW23-03	Chalk	Located in the north-west of the site, cross hydraulic gradient of Area C and up hydraulic gradient from Area A and Area B.
MW23-04	Chalk	Located on the north-eastern site boundary, cross hydraulic gradient of Area C and up hydraulic gradient from Area A and Area B.
MW23-05	Chalk	Located in the south-east of the site, cross hydraulic gradient (south-east) of Remediation Areas B and C. Located up hydraulic gradient of Area A.
MW23-06D	Made ground	Located within footprint of Area B. Decommissioned
MW23-07	Made ground	Located in the north of the site, up hydraulic gradient of Area A and B and the above ground gasholder. Located cross hydraulic gradient of Area C.
MW24-01	Made ground	Located within footprint of Area C. Decommissioned
WS02	Chalk	Located in the centre of the site, down hydraulic gradient of Area C and the above ground gasholder. Located cross hydraulic gradient of Area B and up hydraulic gradient from Area A.
WS04	Raised Marine Deposits	Located in the north-west of the site, down hydraulic gradient of Area C (superficial deposits) and up hydraulic gradient from Area A and Area B.
WS07	Made ground	Located within footprint of Area C. Decommissioned

8.1 Groundwater Trend Analysis

In line with the proposed monitoring plan (Worley Consulting, 2025b), this section of the report provides an overview of the field data/ observations and laboratory data collected during the groundwater monitoring rounds undertaken at the site.

The data has been reviewed, with any observations (e.g. evidence of contamination) documented, together with an assessment of laboratory data against screening values. The assessment provides an evaluation of the data, clearly showing any significant trends and changes in site observations and the concentrations of chemical parameters analysed.

Within the following section, reference is made to the monitoring rounds undertaken in 2023 as Round 1 (R1) and Round 2 (R2), pre-remedial works (2025) as Round 3 (R3), during the works as Round 4 (R4) and the post-remedial works monitoring as Rounds 5 to 7 (R5 to R7).

8.1.1 Visual and Olfactory Signs of Contamination

During the groundwater monitoring programme, geochemical parameters were recorded to help determine the stabilisaiton of conditions during monitoring.

In addition, any visual or olfactory observations of potential contamination were also recorded. Observations recorded during the 2025/2026 monitoring rounds are presented in Appended Table 6. Observations recorded during the 2023 groundwater monitoring exercise are presented in Appended Table 7. Relevant details of visual or olfactory signs of contamination are detailed below in Table 12 below.

Table 12 Visual and Olfactory Signs of Contamination

Well ID	Screened Lithology	Date (Round)	Observation
MW03	Chalk	05/06/2023 (R2)	Water slightly cloudy brown, no sheen, no odour.
MW23-03	Chalk	06/06/2023 (R2)	Slight hydrocarbon odour, no sheen, water clear.
MW23-04	Chalk	15/10/2025 (R5)	Clear and colourless, very mild hydrocarbon odour. No NAPL or sheen present.
		09/12/2025 (R6)	Slightly opaque. Some white floating specks in sample. No odour or sheen
		04/02/2026 (R7)	Some brown sediment, otherwise NVSOC
MW23-05	Chalk	20/04//2023 (R1)	Clear, mild tar odour. No sheen.
		05/08/2025 (R3)	Clear, no sheen, strong hydrocarbon odour.
		10/09/2025 (R4)	Strong hydrocarbon odour. Clear and colourless, no NAPL or sheen.
		15/10/2025 (R5)	Strong hydrocarbon odour. Clear and colourless, no NAPL or sheen.
		09/12/2025 (R6)	Mild hydrocarbon odour, no sheen.
		04/02/2026 (R7)	Strong hydrocarbon odour. Clear and colourless, no NAPL or sheen.
MW23-07	Made Ground	20/04/2023 (R1)	Clear, hydrocarbon odour and sheen.
		06/06/2023 (R2)	Cloudy grey water, hydrocarbon sheen and odour, medium sized particles.
		05/08/2025 (R3)	Silty, opaque, grey, no sheen, moderate hydrocarbon odour.
		09/09/2025 (R4)	Mild hydrocarbon odour, no sheen and clear.
		15/10/2025	Mild hydrocarbon odour, no sheen and clear.

Well ID	Screened Lithology	Date (Round)	Observation
		(R5)	
		09/12/2025 (R6)	NVOSC
		04/02/2026 (R7)	Slightly brown with sediment. Very mild sheen on surface. Mild hydrocarbon odour, no NAPL.
WS02	Chalk	15/10/2025 (R5)	Some brown sediment, otherwise clear, no odour, sheen or NAPL.
		09/12/2025 (R6)	No odour or sheen, slighty cloudy and opaque.
		04/02/2026 (R7)	Slightly brown sediment, earthy odour, no sheen or NAPL.
WS04	Raised Marine Deposits	19/04/2023 (R1)	Cloudy brown, light sulphurous odour with fine brown particles.
		06/06/2023 (R2)	Water grey, sulphur odour.
		05/08/2025 (R3)	NVOSC. Some sandy sediment present.
		04/02/2026 (R7)	NVOSC. Some sandy sediment present.

8.1.2 Generic Quantitative Risk Assessment

Groundwater data collected during the groundwater monitoring programme have been compared to generic assessment criteria considered to be protective of the identified controlled waters receptors in the vicinity of the site.

A generic assessment applies the generic assessment criteria (which indicates the maximum acceptable concentration in the water body) to the concentration of that contaminant at the source.

The distance from source (groundwater sample) to surface water receptor (River Arun) has not been considered in the derivation of assessment criteria and no allowance is made for dilution, retardation or degradation of the contaminant between the source and receptor. This therefore represents a conservative assessment of potential risk. An exceedance of the generic assessment criteria (EQS/ DWS) does not necessarily indicate an unacceptable risk to the receptor, but rather that further, more detailed, risk assessment may be required.

8.1.2.1 Data Screening

Based on the conceptual understanding the site, analytical groundwater results from each of the monitoring rounds have been screened against:

- Environmental quality standards (EQS) for 'other' (transitional) surface water bodies (The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015), considered to be protective of the River Arun, located 105 m south of the site.
- Drinking Water Standards (DWS) (The Water Supply (Water Quality) Regulations 2016, considered suitably protective of the Principal Aquifer (Chalk) (Littlehampton Anticline East groundwater body - DrWPA) underlying the site and River Arun (DrWPA (surface water)) to the south of the site.

Where the laboratory limit of detection exceed the EQS or DWS criteria, only recordable concentrations are considered an exceedance. The screened tables for the 2025/2026 monitoring rounds which are supplemented by the previous groundwater monitoring works undertaken by Worley Consulting in 2023 is presented in Appended Table 8.

8.1.2.2 Exceedances of EQS Criteria

Recorded concentrations of a number of contaminants are noted to exceed the nominated screening criteria considered to be protective of the River Arun (EQS – transitional waters). Appended Table 8 presents the groundwater analytical data throughout the monitoring rounds.

8.1.2.3 Exceedances of DWS Crtiera

Recorded concentrations of a number of contaminants are noted to exceed the nominated screening criteria considered to be protective of the future resource potential of the groundwater body (Principal Aquifer). Appended Table 8 presents the groundwater analytical data throughout the monitoring rounds.

8.1.3 Site Wide Trends

A review of the recorded concentrations of a range of determinands in the Chalk wells at the site has been undertaken. The monitoring wells screened in the made ground (MW23-07) and Raised Marine Deposits (WS04) are located in the north of the site, predominantly up-hydraulic gradient of the remediation areas and therefore unlikely to be impacted by the works.

The data shows site wide exceedances of the EQS for fluoranthene, chromium and mercury in Chalk wells at the site. Localised exceedances are noted for several other low mobility PAH, heavy metals and benzene. Site wide trends have been reviewed, with recorded exceedances subsequently reviewed at each monitoring location.

Recorded concentrations of chloride are noted to be in excess of the DWS across the site. These elevated concentrations within the Chalk wells are likely to be associated with the transitional setting of the site. Localised exceedances of ammonium as NH4, benzo(a)pyrene, TPH bandings and benzene were also recorded. Trends at each monitoring location are discussed in Section 8.1.4.2.

8.1.3.1 Chromium

Concentrations of chromium are noted to exceed the EQS within the Chalk wells throughout the monitoring program, with recorded concentrations of similar magnitude across the site within each round.

Maximum concentrations of chromium were recorded in R5 in the majority of wells (Figure 1 below). There is no notable increase in concentration as the groundwater passes beneath the site, with concentrations at MW23-03 (hydraulically up gradient) approximately 0.0033 $mg.L^{-1}$ (R5) comparable to those recorded at wells in the south of the site (down hydraulic gradient) (0.005 $mg.L^{-1}$ at MW23-01 and 0.003 $mg.L^{-1}$ at MW23- 05).

Following the site wide peak in R5, recorded concentrations at each of the monitoring well locations have returned to within 0.0002 $mg.L^{-1}$ of recorded concentrations in 2023, with the

exception of MW01 (within 0.001 mg.L^{-1}), MW23-01 (0.0005 mg.L^{-1}) and WS02 (0.0008 mg.L^{-1}).

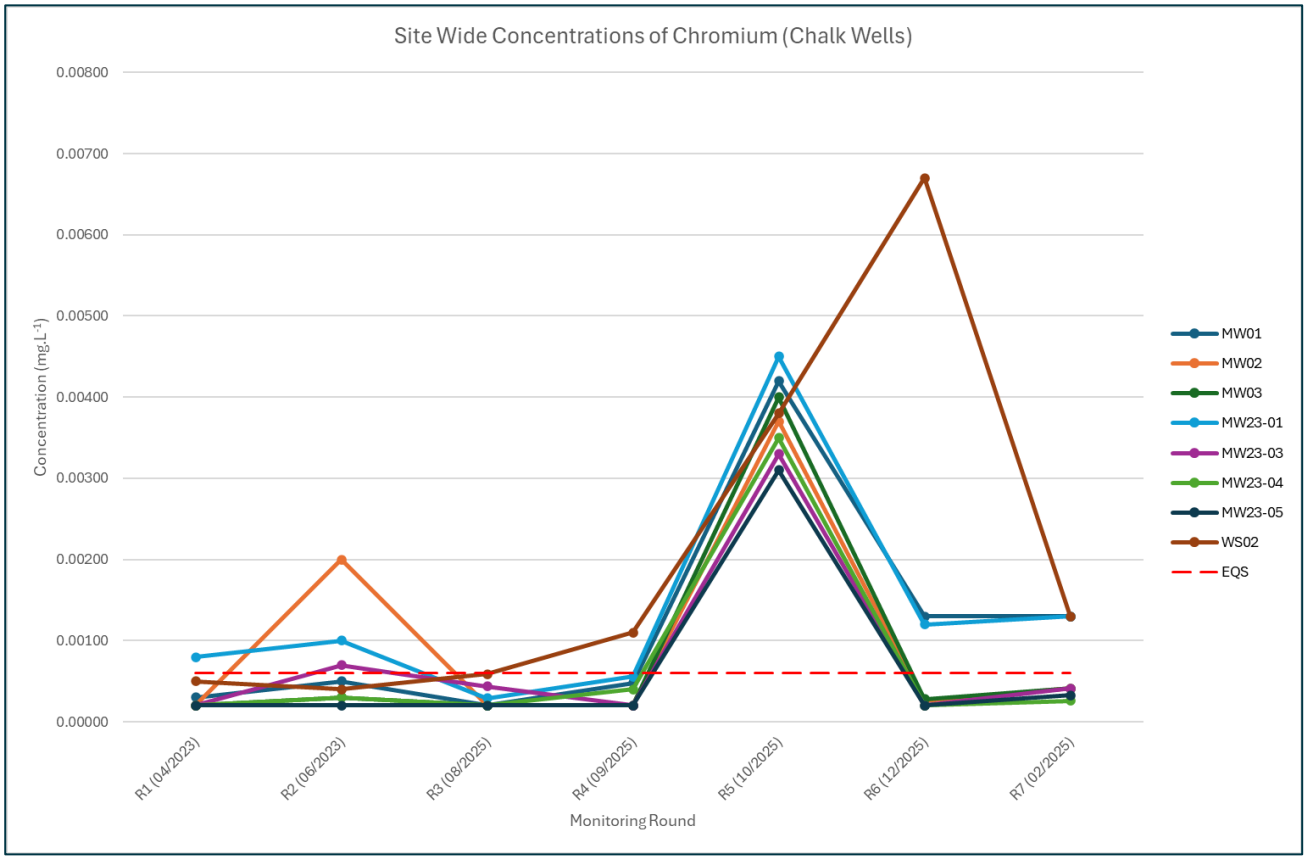


Figure 1 Recorded Concentrations of Chromium in Chalk Wells across the Site

8.1.3.2 Mercury

A similar trend is noted for mercury, with comparable concentrations recorded in up hydraulic gradient wells and down hydraulic gradient wells (Figure 2 below). Concentrations in R6 at both MW23-03 (up) and MW23-01 (down) were recorded at 0.00008 mg.L^{-1}. Concentrations at MW23-05 (down) were below the LOD. The similarity in dissolved phase concentrations between up-hydraulic gradient wells and those down hydraulic gradient of the remediation areas indicates that the site is not contributing significantly to the load within the aquifer.

Fluctuations in recorded concentrations are also noted to be similar across the site, with increases observed in R4 and R6 in the majority of wells at the site, with a general fall in concentration recorded site wide in R7.

These site wide trends in concentration indicate that the variability in the dissolved phase concentrations is unlikely to be associated with the works undertaken at the site, but reflect changes within the wider aquifer.

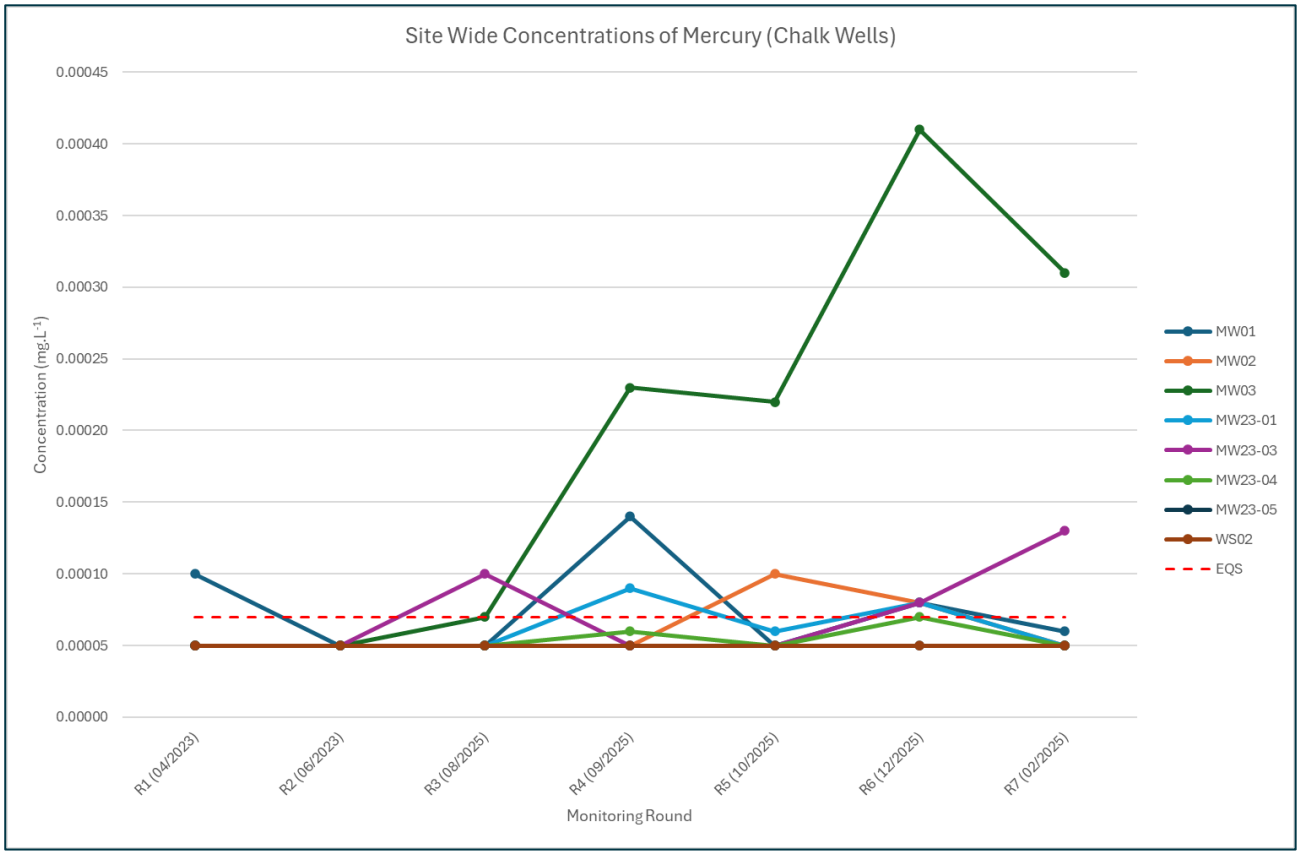


Figure 2 Recorded Concentrations of Mercury in Chalk Wells across the Site

8.1.3.3 Fluoranthene

Concentrations of fluoranthene are also noted to have a similar trend in each of the monitoring wells across the site (Figure 3 below), with changes in concentration mirrored across the site. Changes are more marked in WS02, MW23-05 and MW23-04. WS02 is located to the south of the above ground gasholder and MW23-05 and MW23-04 are located on the eastern site boundary, proximal to the off site wider former gasworks.

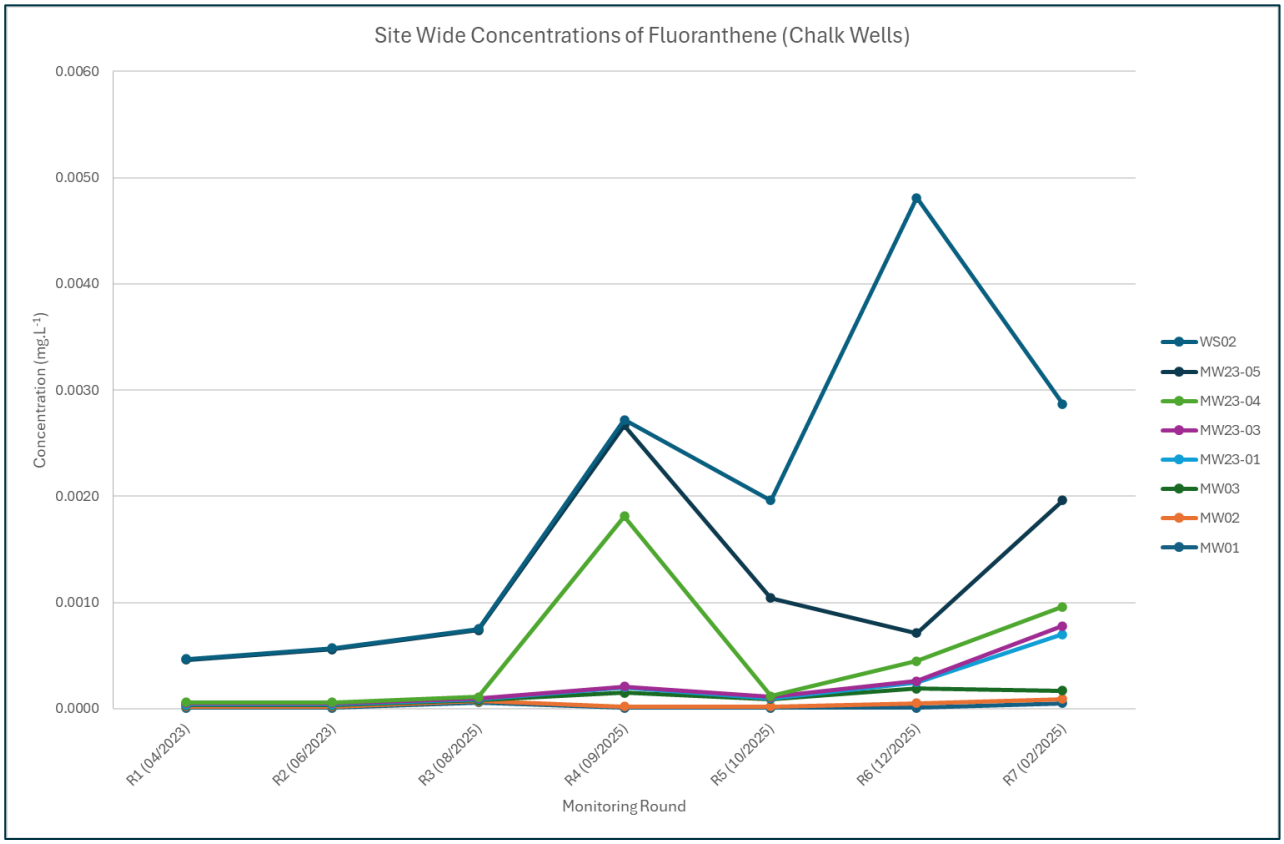


Figure 3 Recorded concentrations of Fluoranthene in Chalk Wells across the Site

8.1.3.4 Chloride

Recorded concentrations of chloride are noted to remain fairly constant in wells across the site (Figure 4 below), with MW23-03, located in the north-west of the site recording the highest concentrations. Exceedances are recorded in MW01, MW02 and MW23-03 in the majority of monitoring rounds, with occasional exceedances recorded in MW03.

The elevated concentrations are likely to be associated with the transitional site setting, saline intrusion and tidal nature of the groundwater within the Chalk at the site.

A detailed review of the trends in dissolved phase concentration has been undertaken below.

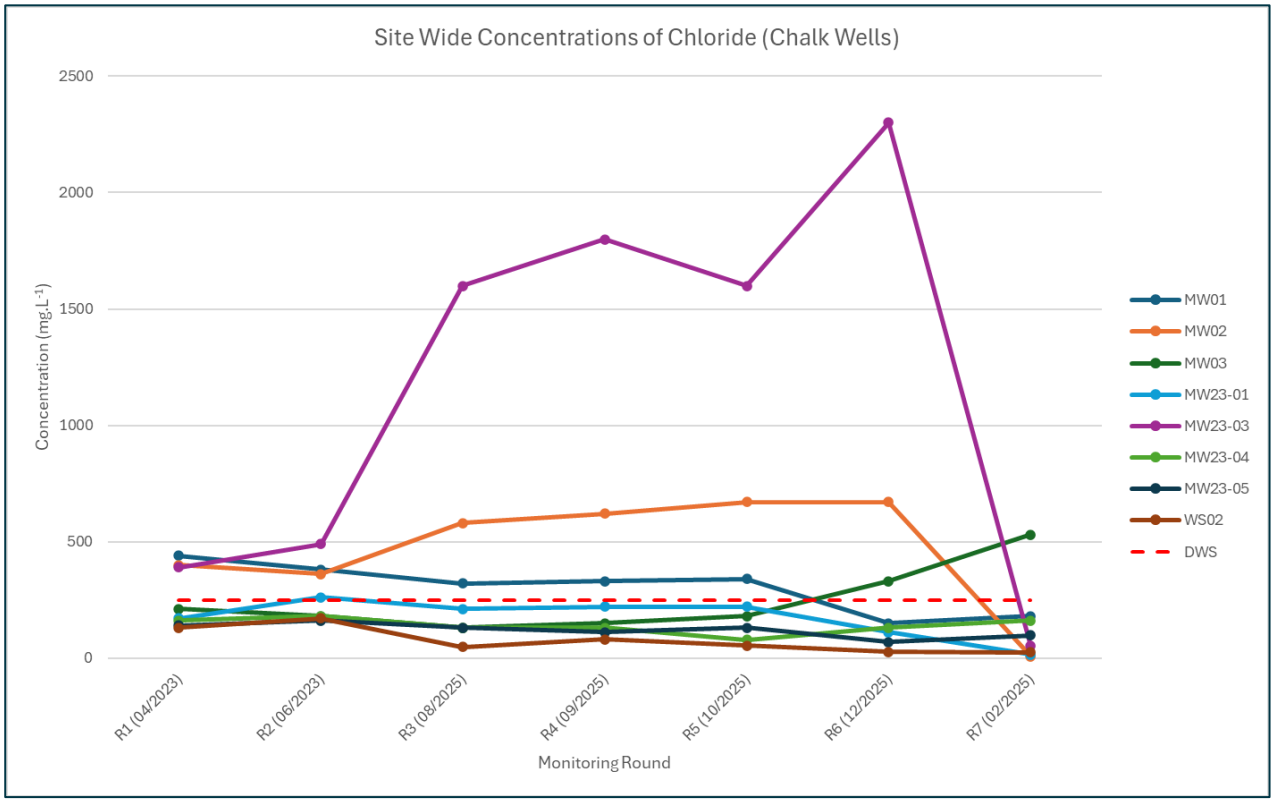


Figure 4 Recorded concentrations of Fluoranthene in Chalk Wells across the Site

8.1.4 Risk Evaluation

A review of the concentrations of the substances which are noted to exceed the adopted screening criteria is presented below. The exceedances are reviewed below for each of the wells monitored across the site.

8.1.4.1 Surface Water Receptor – River Arun

- **MW01 (Chalk)**
  - PAH
    - Exceedances of the EQS for fluoranthene were recorded in R3 (pre works) and R7 (post works). Concentrations were below the Laboratory Limit of Detection (LOD) in all other rounds.
    - Recorded concentrations are of the same order of magnitude in R3 and R7 (0.00006 $mg.L^{-1}$ and 0.00005 $mg.L^{-1}$). Therefore, the post-works exceedance recorded in R7 is unlikely to be attributable to the works undertaken at the site.
    - Claire (2017) indicate that TPH Aromatic EC16-EC21 have low mobility within groundwater. Based on the recorded concentrations of the PAH and the environmental mobility of fluoranthene, the exceedances are unlikely to pose an unacceptable risk to the River Arun within a reasonable timeframe. In accordance with the guidance given in the RTM (Environment Agency, 2006) a contaminant breakthrough time of 1,000 years is considered for assessing whether a contaminant may reach the receptor within a reasonable timeframe.

- Metals
  - Exceedances of the EQS for chromium and mercury were also recorded at MW01.
  - Chromium concentrations in excess of the EQS (0.0006 mg.L^{-1}) were recorded in the post works monitoring rounds (R3-R5). No exceedances were recorded in R1 to R4. Concentrations in R3-R5 ranged between 0.0013 mg.L^{-1} and 0.0042 mg.L^{-1}. MW01 is screened in the Chalk, down hydraulic gradient of remediation Area C.
  - Works within Area C were limited to the upper 2 m (excavation) to 2.5 m (clay cut off wall). Geological logs for the area (WS07) indicate that the made ground in the area is underlain by Raised Marine Deposits (RMD) to at least 6.45 m bgl (full thickness not proved). The RMD are described as silty sandy clay and likely to limit the vertical migration of contaminants to the underlying Chalk. Therefore, it is considered unlikely that the works within the shallow made ground have resulted in the increase in concentration of chromium at MW01.
  - Concentrations of mercury (inorganic) are also in excess of the EQS at MW01. Exceedances were recorded in R1, R4 and R6. Concentrations are noted to be marginally in excess of the EQS (0.00007 mg.L^{-1}), ranging between 0.00008 mg.L^{-1} and 0.00014 mg.L^{-1}. Low level exceedances were recorded pre-works and post works, as such the exceedances are unlikely to be attributable to the remedial works undertaken at the site.

- **MW02 (Chalk)**
  - PAH
    - Exceedances of the EQS for fluoranthene were recorded in R6 and R7. Concentrations were below the Laboratory Limit of Detection (LOD) in all other rounds. The recorded concentrations are the same (0.00004 mg.L^{-1}).
    - As noted above, based on the low mobility of fluoranthene in groundwater, the recorded concentrations of fluoranthene are unlikely to pose an unacceptable risk to the River Arun within a reasonable timeframe.
  - Metals
    - Exceedances of the EQS for chromium, mercury and zinc were also recorded at MW02.
    - Chromium is recorded in excess of the EQS (0.0006 mg.L^{-1}) in R2 and R5, with concentrations below the LOD in R1, R3 and R4, with concentrations below the EQS in R6 and R7. The inconsistent nature of the exceedances, (pre and post works) indicates that they are unlikely to be associated with the works.
    - Recorded concentrations of mercury exceed the EQS in two of the seven monitoring rounds (R5 and R6). These exceedances (0.00010 mg.L^{-1} and 0.00008 mg.L^{-1}) are noted to be only marginally in excess of the EQS (0.00007 mg.L^{-1}).
    - A single exceedance of the EQS for zinc (0.0079 mg.L^{-1}) was recorded in R4. This exceedance (0.0098 mg.L^{-1}) is also only marginally in excess of the EQS.
    - Given the low level and occasional exceedances, recorded concentration of the heavy metals, chromium, mercury and zinc, are unlikely to pose an unacceptable risk to the River Arun.

- **MW03 (Chalk)**
  - PAH
    - Exceedances of fluoranthene recorded in R4 to R7. Concentrations were below the Laboratory Limit of Detection (LOD) in all other rounds.

- Recorded concentrations of naphthalene are also recorded in excess of the EQS in rounds R1 and R3. All other rounds report the concentrations below the LOD.
- Recorded concentrations of naphthalene have decreased over time, with concentrations below the LOD in R4 to R7. Recorded concentrations of fluoranthene, whilst in excess of the EQS are also noted to decrease through R3 (pre-works) to R7 (post-works), as illustrated in Figure 5 below.

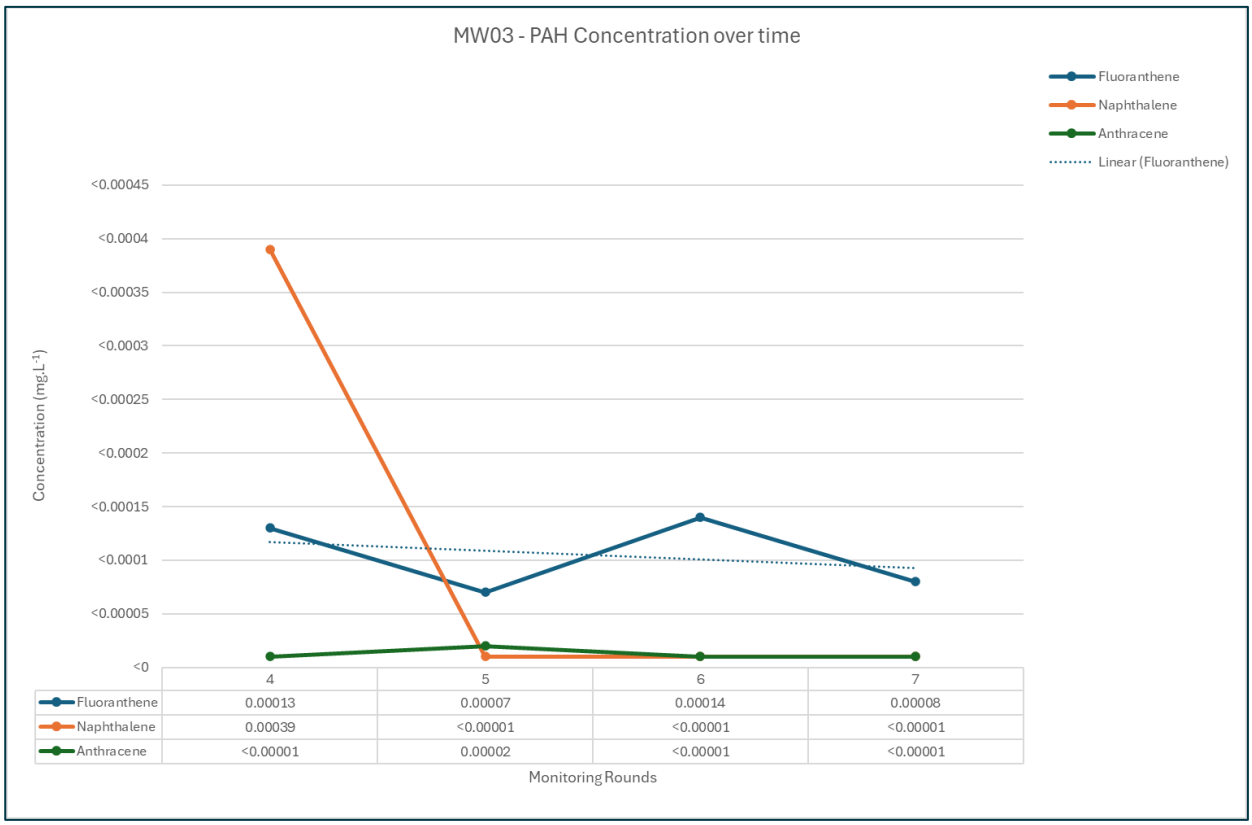


Figure 5 MW03 (Chalk) Recorded Concentrations of PAHs

- As noted above, fluoranthene has low mobility within groundwater, therefore the recorded concentrations in MW03 are unlikely to pose an unacceptable risk to the River Arun within a reasonable timeframe.

- Metals
  - Recorded concentrations of chromium and mercury exceed the EQS at MW03.
  - A single exceedance of chromium is recorded in R5. No other exceedances were recorded during the post works monitoring.
  - Recorded concentrations of mercury are in excess of the EQS (0.00007 $mg.L^{-1}$) in R3 to R7. The concentrations are of a similar magnitude ranging between 0.00007 $mg.L^{-1}$ to 0.00041 $mg.L^{-1}$. Concentrations are noted to increase through the monitoring rounds, peaking in R6 and falling in R7.
  - No exceedances of the import criteria for mercury were recorded within the imported material used during the works. The leachate concentrations were also not recorded to be in excess of the EQS.
  - Given the low level and occasional exceedances, recorded concentration of the heavy metals, chromium and mercury, are unlikely to pose an unacceptable risk to the River Arun.

- **MW23-01 (Chalk)**
  - PAH
    - Recorded concentration of fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene and benzo(a)pyrene were in excess of the EQS at MW23-01. The monitoring well is located the south of the site, down hydraulic gradient of remediation Areas A and C and the above ground gasholder.
    - Exceedances of fluoranthene were recorded in R4, R6 and R7. Concentrations are noted to be only marginally in excess of the LOD. As noted above, fluoranthene has low mobility within groundwater and the recorded concentrations are unlikely to pose an unacceptable risk to the River Arun within a reasonable timeframe.
    - Exceedances of benzo(b)fluoranthene, benzo(k)fluoranthene and benzo(a)pyrene were recorded in a single round (R7), with all other results recorded below the LOD. The single exceedances are therefore not considered representative of the post works conditions. Each of these PAHs are noted to have very low mobility within groundwater. As such, these single exceedances of the PAHs are not considered to pose an unacceptable risk to the River Arun within a reasonable timeframe.
  - Metals
    - Recorded concentrations of chromium, mercury and zinc exceed the EQS at MW23-01.
    - Concentrations of chromium are in excess of the EQS in R1, R2, R5, R6 and R7. Recorded concentrations are noted to be of the same order of magnitude pre and post works (0.001 $mg.L^{-1}$ to 0.005 $mg.L^{-1}$). The exceedances are therefore unlikely to be associated with the works undertaken at the site.
    - Recorded concentrations of mercury were in excess of the EQS in R4 and R6. Concentrations were noted to be only marginally in excess of the EQS. As such, these low level exceedances of the PAHs are not considered to pose an unacceptable risk to the River Arun.
    - A single exceedance of zinc was recorded in R5 of the monitoring programme. Concentrations were not noted to exceed the EQS in R6 and R7, with concentrations an order or magnitude lower than the recorded exceedance. Zinc is therefore not considered to pose an unacceptable risk to the River Arun.
- **MW23-03 (Chalk)**
  - PAH
    - A single exceedance of the EQS for fluoranthene was recorded in R7. All other record concentrations were below the LOD. Therefore, fluoranthene is not considered to pose an unacceptable risk to the River Arun.
  - Metals
    - Recorded concentrations of chromium (R2 and R5) and mercury (R3, R6 and R7) exceed the EQS in MW23-03.
    - MW23-03 is located in the north-west of the site, cross hydraulic gradient of Area C and up hydraulic gradient from Area A and Area B. It is likely that the monitoring location is reflective of conditions in the wider aquifer.
- **MW23-04 (Chalk)**
  - Benzene
    - Recorded concentrations of benzene were in excess of the EQS in R4 (during-works) and R7 (post-works). Concentrations were below the LOD in all other rounds. The

annual average concentration at MW23-04 (0.0085 mg.L^{-1}) is at the EQS (0.008 mg.L^{-1}).

  - Based on the occasional nature of the exceedances and the likely attenuation within the aquifer, benzene concentrations recorded at MW23-04 are unlikely to pose an unacceptable risk to the River Arun.

- PAH
  - Recorded concentrations of anthracene and fluoranthene exceed the EQS within MW23-05.
  - Concentrations of anthracene exceed the EQS in R4 and R7. Concentrations (0.00011 mg.L^{-1} and 0.0003 mg.L^{-1}) are noted to be only marginally in excess of the EQS (0.0001 mg.L^{-1}).
  - Recorded concentrations of fluoranthene exceed the EQS in R4, R6 and R7. All other recorded concentrations are below the LOD.
  - The recorded concentrations of the low mobility PAH are unlikely to pose an unacceptable risk to the River Arun.
- Metals
  - Single exceedances of chromium (R5), mercury (R6) and zinc (R5) were recorded at MW23-04.
    - Given the occasional and low level exceedances, recorded concentration of the heavy metals, chromium, mercury and zinc, are unlikely to pose an unacceptable risk to the River Arun.
    - Located on the north-eastern site boundary, cross hydraulic gradient of Area C and up hydraulic gradient from Area A and Area B. It is likely that the monitoring location is reflective of conditions in the wider aquifer. The monitoring location is also noted to be down hydraulic gradient of the former offsite gasworks to the east.

- **MW23-05 (Chalk)**
  - Benzene
    - Located in the south-east of the site, cross hydraulic gradient (south-east) of Remediation Areas B and C and up hydraulic gradient of Area A.
    - MW23-05 is located within 10 m of Area B and down hydraulic gradient of the off-site former gasworks. At this location, the Chalk is separated from the made ground by approximately 0.65 m of Raised Marine Deposits (cohesive) which is likely to limit the downward migration of contaminants.
    - Recorded concentrations of benzene exceed the EQS in all seven monitoring rounds. Concentrations are noted to increase between R1 and R4, but then fall between R4 and R6. An uncharacteristic peak is noted in R7.

Figure 6 MW23-05 (Chalk) Recorded Concentrations of Benzene R3-R7

- Using data from 2025 and excluding the anomalously high concentration in R7 the data indicates a flat trendline, with some variability in concentration, but a consistent trend.

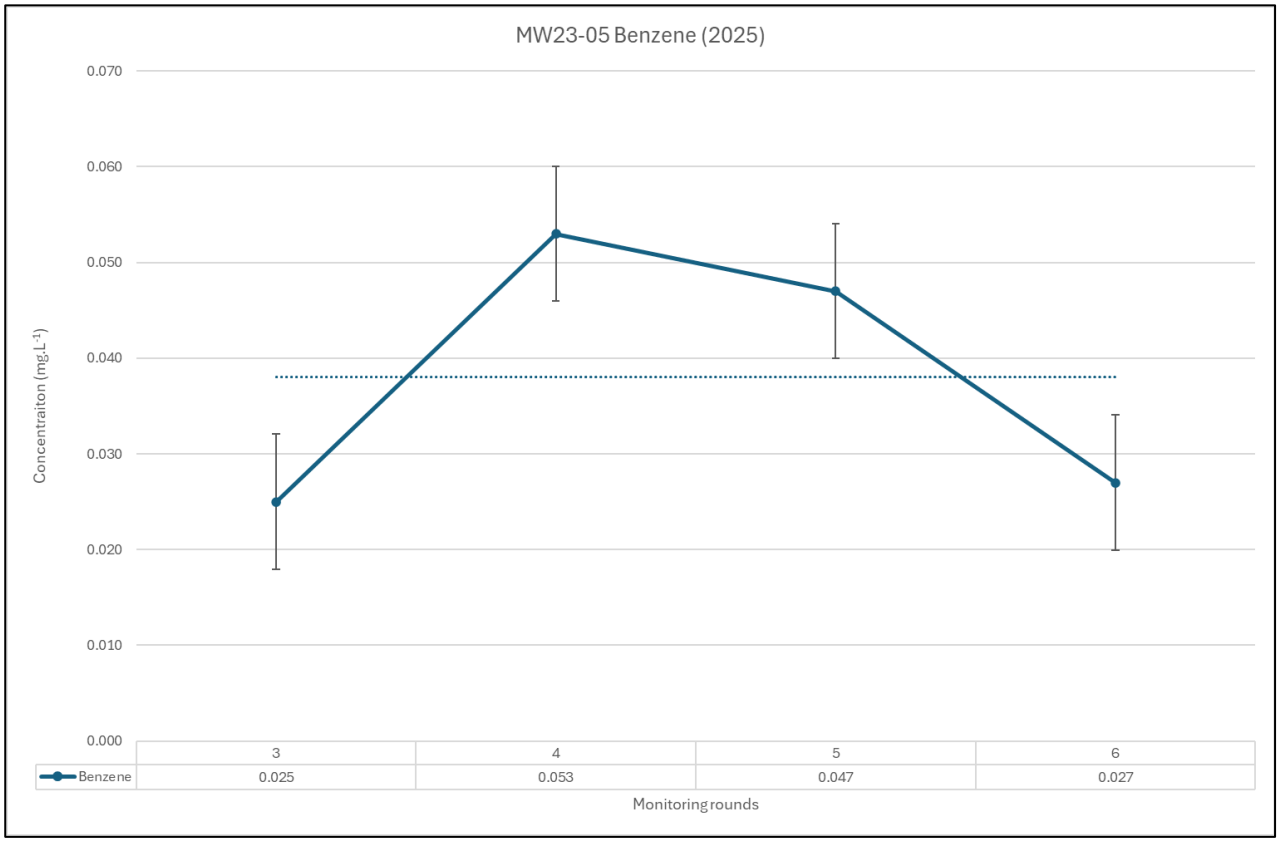
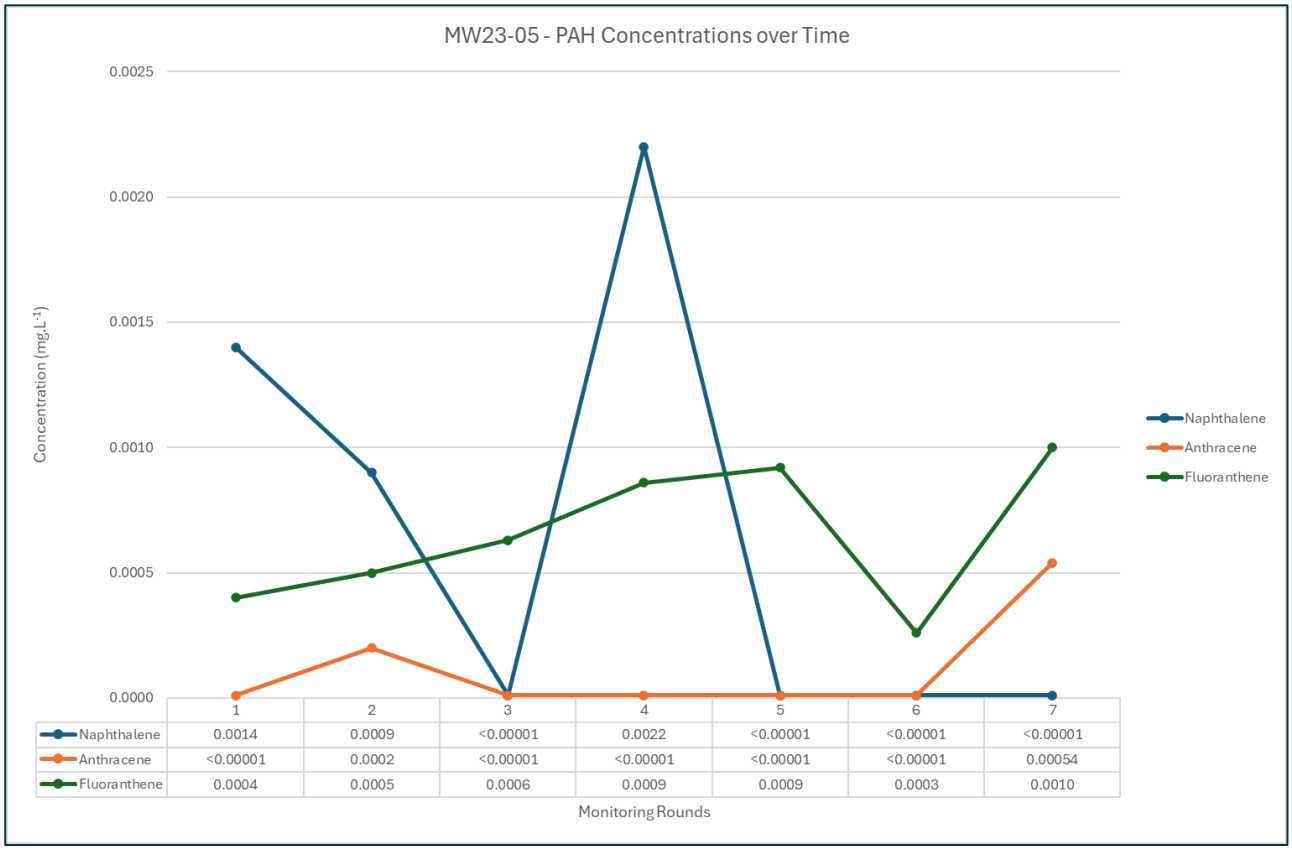


Figure 7 MW23-05 (Chalk) Recorded Concentrations of Benzene R3-R6 (with trendline)

- PAH
  - Recorded concentrations of naphthalene, anthracene and fluoranthene exceed the EQS within MW23-05.
  - A single exceedance of naphthalene was recorded in R4. This exceedance (0.0022 mg.L^{-1}) is only marginally in excess of the EQS (0.002 mg.L^{-1}). Recorded concentrations in R5 to R7 are all below the LOD (<0.00001 mg.L^{-1}).
  - Two exceedances of the EQS for anthracene (0.0001 mg.L^{-1}) are recorded, in R2 and R7. All other rounds are noted to be below the LOD. Recorded concentrations of anthracene in R7 are anomalously elevated with respect to the dataset.
  - Concentrations of fluoranthene are recorded in excess of the EQS in each of the monitoring rounds. Concentrations are noted to decrease between R5 and R6, with a spike in concentration in R7.



	1	2	3	4	5	6	7
Naphthalene	0.0014	0.0009	<0.00001	0.0022	<0.00001	<0.00001	<0.00001
Anthracene	<0.00001	0.0002	<0.00001	<0.00001	<0.00001	<0.00001	0.00054
Fluoranthene	0.0004	0.0005	0.0006	0.0009	0.0009	0.0003	0.0010

Figure 8 MW23-05 (Chalk) Recorded Concentrations of PAHs

- Based on the decreased trend in concentration of naphthalene and the low mobility of the PAH in groundwater, the recorded concentrations of PAH at MW23-05 are unlikely to pose a risk to the River Arun within a reasonable timeframe.

- Metals
  - There is a single exceedance of the EQS for chromium in R5, with concentrations falling by an order of magnitude by R7.
  - Given the low level and occasional exceedances, recorded concentration of the chromium are unlikely to pose an unacceptable risk to the River Arun.

- **WS02 (Chalk)**
  - PAH
    - Recorded concentration of fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and benzo(ghi)perylene were in excess of the EQS at WS02. These exceedances are predominantly recorded in R5, R6 and R7. Concentrations of the PAH are noted to peak in R6.

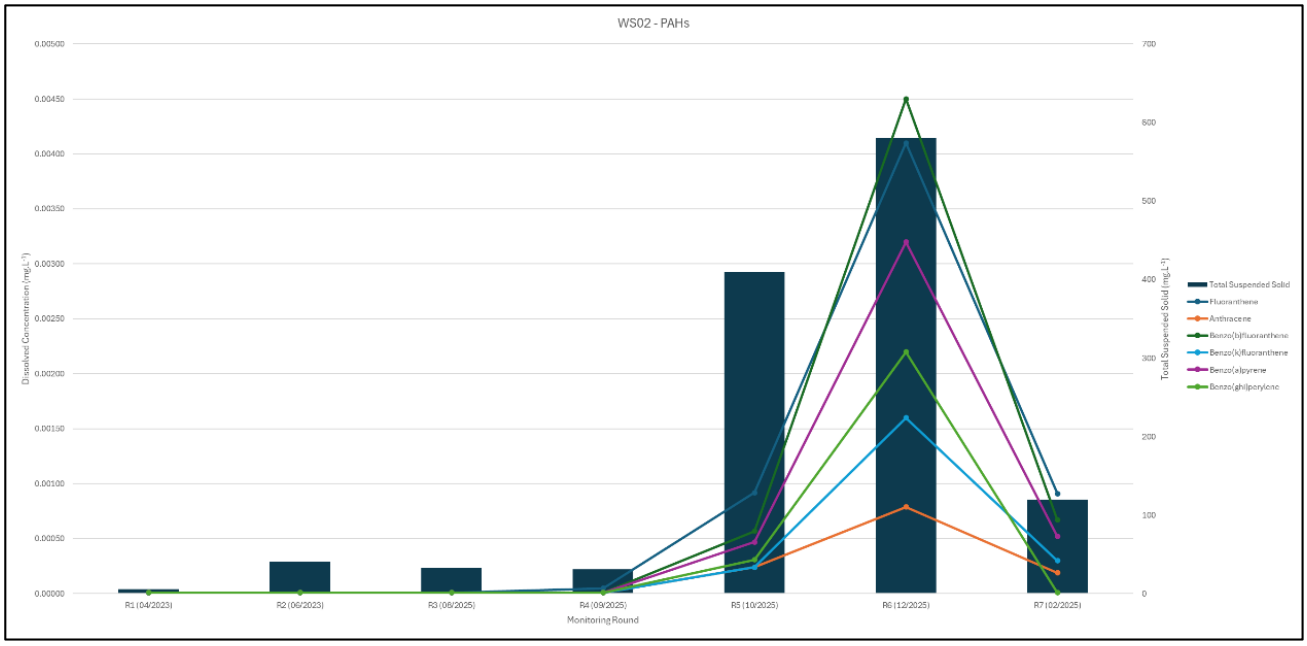


Figure 9 WS02 (Chalk) Recorded Concentrations of PAHs

- Visual observations during these groundwater monitoring rounds recorded that the purged waters contained sediment or were opaque. Total Suspended Solids (TSS) were recorded in excess of 120 $mg.L^{-1}$ in each of the rounds, with R6 recording concentrations of 580 $mg.L^{-1}$. The levels of TSS in the recovered samples from R5 to R7 indicate a high degree of turbidity/ sediment load.
- Sediment load can be a cause of false positive results in groundwater samples, particularly for metals and organic compounds with high sorbtion coefficients. The suspended solids bind with the contaminants, causing them to appear in laboratory analysis as if they are dissolved in the water, when they are actually part of the suspended solid.
- Low flow sampling was employed during the works which significantly reduces the turbidity in the well, resulting in fewer suspended particles.
- Despite these precautions there appears to be correlation between the peak in the PAH concentration and TSS in R6.
- Recorded concentrations are noted to be of a similar magnitude in R5 and R7.
- Despite the elevated concentrations recorded in WS02, the low mobility of the PAHs recorded in excess of the EQS indicate that these hydrocarbons are unlikely to pose an unacceptable risk to the River Arun within a reasonable timeframe.

• Metals

- Exceedances of the EQS for chromium, lead and zinc were recorded in WS02.
- Concentrations of chromium were in excess of the EQS between R4 and R7. Concentrations of zinc were in excess of the EQS between R5 and R7 and there was a single exceedance of lead in R7.
- The patterns of exceedance mirror those of the PAHs above and may be an artifact of the turbidity levels in the groundwater sample.
- It is noted that WS02 is located down hydraulic gradient of the former above ground gasholder and associated partially below ground tank.

8.1.4.2 Ground Water Receptor – Chalk Bedrock

- **MW01**
  - Chloride concentrations exceed the DWS in R1 to R5, with concentrations falling below the DWS in R6 and R7. As noted above, the elevated concentrations of chloride are likely to be associated with the site setting and saline intrusion at within groundwater at the site. As such, the recorded concentrations are considered likely a reflection of conditions within the wider aquifer.
  - A single exceedance of the DWS for benzene was recorded in R4, all other rounds recorded concentrations at less than the LOD. The single exceedance (0.002 $mg.L^{-1}$) is only marginally in excess of the DWS. Therefore, the single exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
  - A single exceedance of the DWS for Aromatic TPH C21-35 was recorded in R3, all other rounds recorded concentrations at less than the LOD. The mobility of Aromatic TPH C21-35 carbon band is very low. Therefore, this single exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- **MW02**
  - Chloride concentrations exceed the DWS in R1 to R6, with concentrations falling below the DWS in R7. As noted above, the elevated concentrations of chloride are considered likely a reflection of conditions within the wider aquifer.
  - A single exceedance of the DWS for conductivity was also noted in R7 (only). The elevated conductivity concentration is also likely reflective of the transitional site setting and conditions within the wider aquifer.
  - A single exceedance of the DWS for iron was recorded in R6. This single exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- **MW03**
  - Chloride concentrations exceed the DWS in R6 and R7, with concentrations below the DWS in R1 to R5. As noted above, the elevated concentrations of chloride are considered likely a reflection of conditions within the wider aquifer.
  - A single exceedance of the DWS for benzene was recorded in R4, all other rounds recorded concentrations at less than the LOD. The single exceedance (0.003 $mg.L^{-1}$) is only marginally in excess of the DWS. Therefore, the single exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- **MW23-01**
  - Chloride concentrations exceed the DWS in R2, with concentrations below the DWS in R1 and R3 to R5. As noted above, the elevated concentrations of chloride are considered likely a reflection of conditions within the wider aquifer.
  - A single exceedance of the DWS for benzo(a)pyrene was recorded in R7. A single exceedance of the DWS for sum of 4 PAH was also recorded in R7. Concentrations are below the LOD for both benzo(a)pyrene and sum of 4 PAH in all of the previous monitoring rounds. Therefore, these single exceedances are not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- **MW23-03**

- Recorded concentrations of chloride and conductivity are in excess of the DWS in R1 to R6 and R3 to R7, respectively. As noted above, the elevated concentrations of chloride are considered likely a reflection of conditions within the wider aquifer.
- A single exceedance of the DWS for sulphate was recorded in R6, the recorded exceedance (280 $mg.L^{-1}$) is only marginally in excess of the DWS (250 $mg.L^{-1}$), therefore the recorded concentration is not considered to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- A single exceedance of the DWS for benzene was recorded in R2, all other rounds recorded concentrations at less than the LOD (<0.001 $mg.L^{-1}$). The inconsistent exceedances are not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.

- **MW23-04**
  - Recorded concentrations of ammonium as NH_4 exceed the DWS in R1 and R3 to R7. Concentrations are comparable pre and during works, although concentrations are noted to be higher in R5 to R7.
  - MW23-04 is located on the north-eastern site boundary, up (MW23-04) hydraulic gradient of Area B and cross hydraulic gradient from Area C. The monitoring locations is located up hydraulic gradient of Area A. Based on the monitoring well location, it is unlikely that the works have influenced the dissolved phase concentrations recorded in the groundwater at this location. The monitoring well is noted to be down hydraulic gradient of the former offsite gasworks to the east.
  - Recorded concentration of benzene exceed the DWS in R4 and R7, all other rounds recorded concentrations at less than the LOD (<0.001 $mg.L^{-1}$). Based on the occasional nature of the exceedances and the likely attenuation within the aquifer, benzene concentrations recorded at MW23-04 are unlikely to pose an unacceptable risk to the resource potential of the Principal Aquifer.

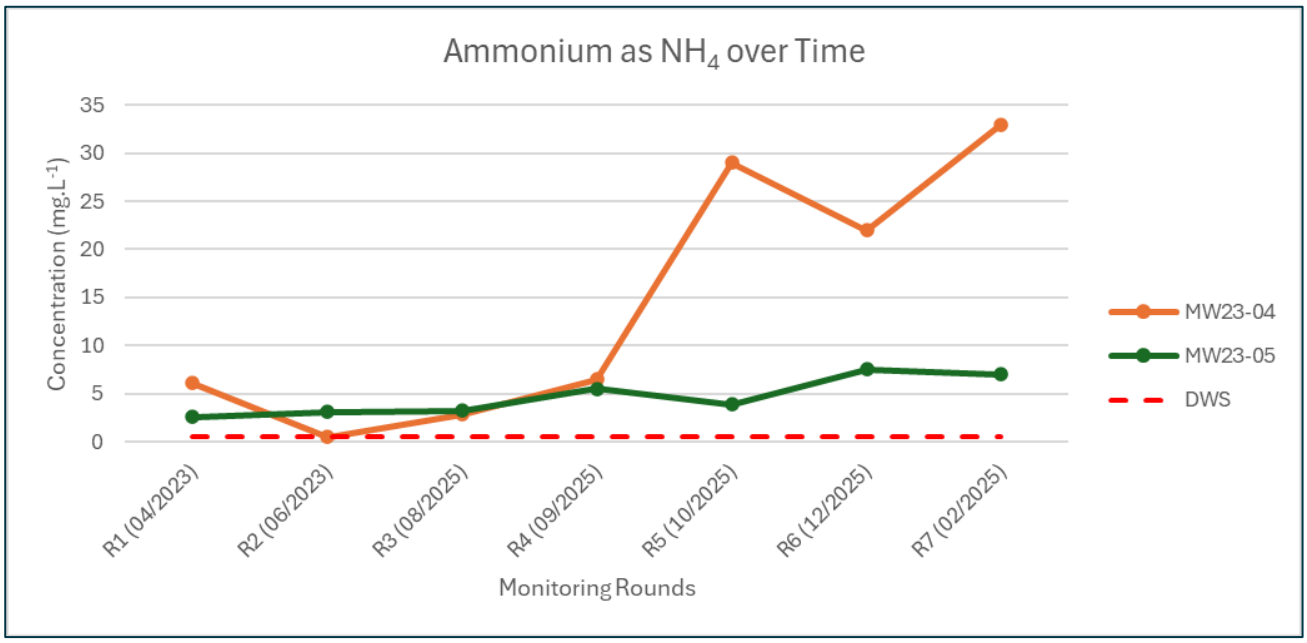


Figure 10 Recorded Concentrations of Ammonium as NH4 in MW23-04 and MW23-05

- **MW23-05**

- Recorded concentrations of ammonium as NH_4 exceed the DWS in all monitoring rounds (R1 to R7). Concentrations are comparable pre and post works, therefore the exceedances are not considered to be associated with the remediation works at the site. MW23-05 is located on the north-eastern site boundary, cross hydraulic gradient of Area B and Area C and up hydraulic gradient of Area A. Based on the monitoring well location and consistency of concentrations pre and post works, it is unlikely that the works have influenced the dissolved phase concentrations recorded in the groundwater at this location. The monitoring well is noted to be down hydraulic gradient of the former offsite gasworks to the east.
- A single, marginal (0.011 $mg.L^{-1}$) exceedance of the DWS (0.01 $mg.L^{-1}$) for arsenic is recorded in R7. Recorded concentrations in previous rounds are more than an order of magnitude lower than those recorded in R7. This low level, inconsistent exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
- TPH
  - Recorded concentrations of benzene, TPH aromatic C10-12, TPH aromatic C12-16, TPH aromatic C16-21 and TPH aromatic C21-35 exceed the DWS in pre and post works monitoring rounds.
  - Exceedances of benzene are recorded in all seven monitoring rounds, as noted above, concentrations remain reasonably stable between R3 and R6, with an increase in concentration recorded in R7.
  - Concentrations of TPH aromatic C10-12 exceed the DWS in four monitoring rounds (R1, R2, R4 and R7), TPH aromatic C12-16 in four monitoring rounds (R2, R4, R5 and R7), TPH aromatic C16-21 in three monitoring rounds (R2, R4 and R7) and TPH aromatic C21-35 in three monitoring rounds (R3, R4 and R7). All TPH fraction are noted to have decreased to below the LOD in R6, with a spike noted in R7(Figure 11 below).

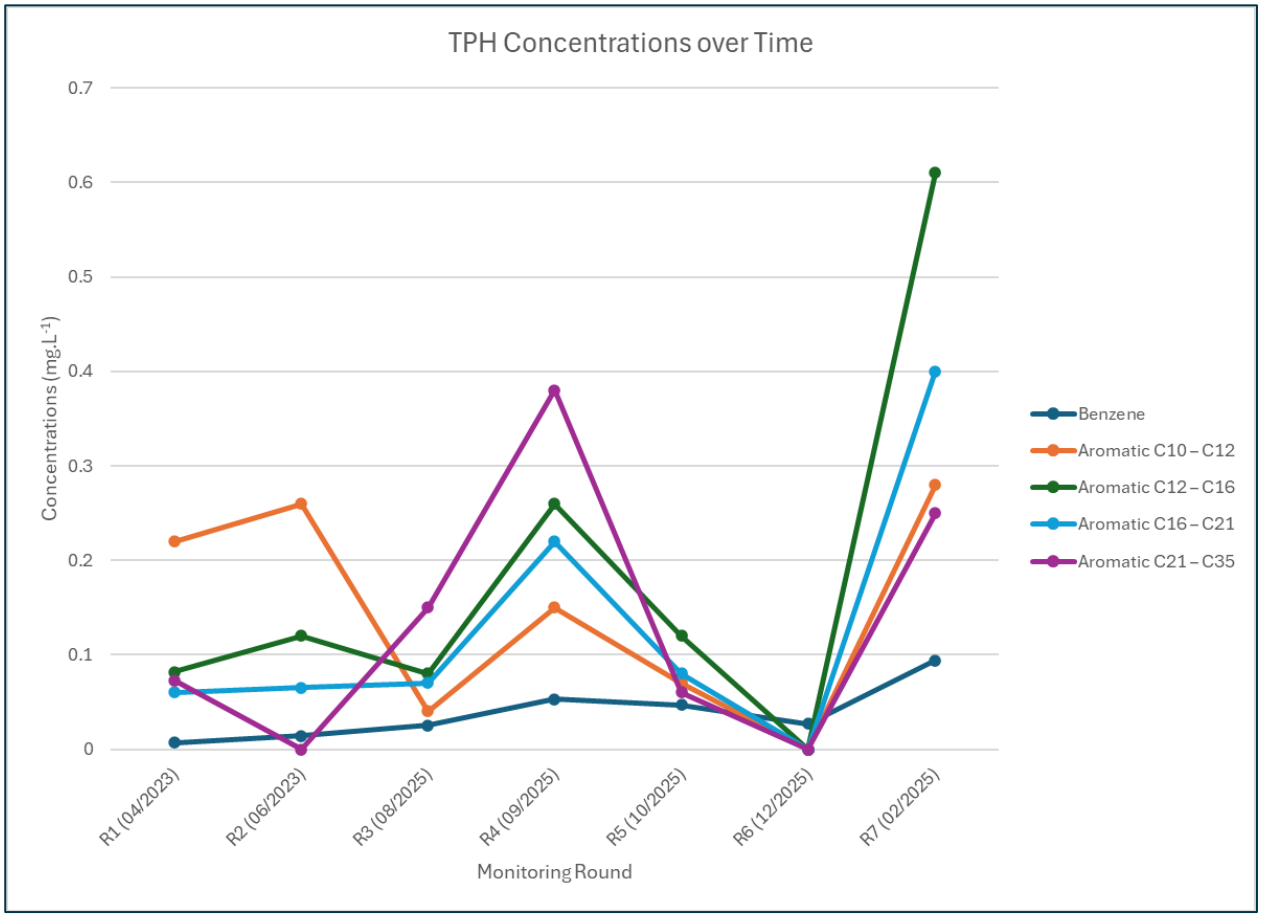


Figure 11 Recorded Concentrations of TPH Fractions and Benzene in MW23-05 (R1 to R7)

- A similar trend is noted for all TPH, with concentrations peaking in R4, before falling in R5 and R6 and spiking in R7. Pre (R3) and post works (R5) concentrations (2025) are noted to be comparable for the majority of fractions, with decreasing trendlines through R5 and R6 (Figure 12 below).

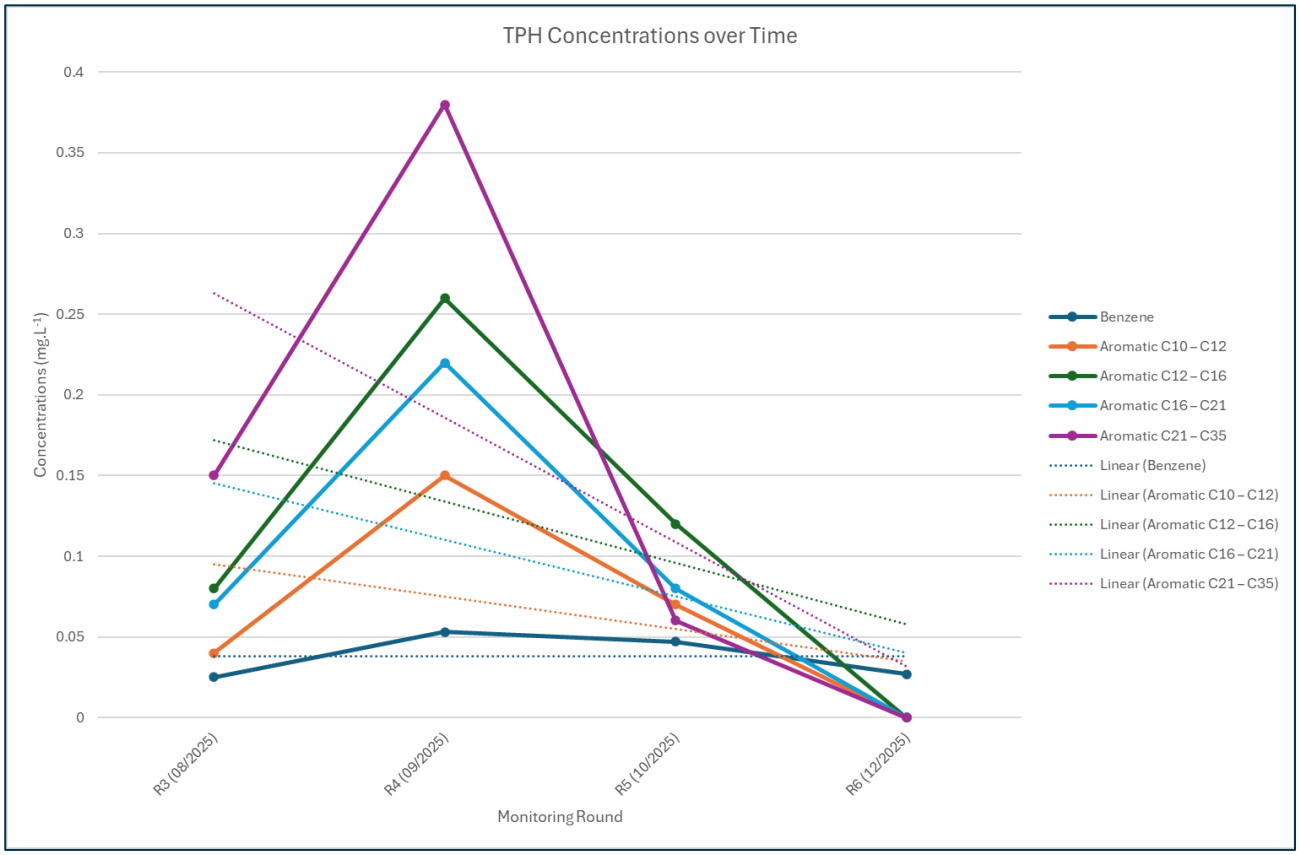


Figure 12 Recorded Concentrations of TPH Fractions and Benzene in MW23-05 (R3 to R6)

- **WS02**
  - A single exceedance of the DWS for iron was recorded in R6. This single, low level, exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
  - A single exceedance of the DWS for Aromatic TPH C21-35 was recorded in R4, all other rounds recorded concentrations at less than the LOD. The mobility of Aromatic TPH C21-35 carbon band is very low. Therefore, this single exceedance is not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.
  - Exceedance of the DWS for benzo(a)pyrene was recorded in R5 to R7. Exceedance of the DWS for sum of 4 PAH were also recorded in R5 to R7. Concentrations are below the LOD for both benzo(a)pyrene and sum of 4 PAH in all of the previous monitoring rounds. The mobility of these PAH bands in groundwater is very low. As noted above the TSS in R5 to R7 are high, indicating the potential for a false positive for PAH which have strong sorption coefficients, such as benzo(a)pyrene. Therefore, the recorded exceedances are not considered likely to pose an unacceptable risk to the resource potential of the Principal Aquifer.

9. Final Site Condition

9.1 Site Condition

The objectives for the *works* as defined in the PWI (Worley Consulting, 2025) and presented in Section 3.2 have been achieved for continued existing use as a vacant former gasholder station with an operational leased telecommunications compound in the north.

Finished ground levels are shown on the as-built drawing included in Appendix J (iii) (Volume II) and the finished ground levels presented as Appended Figure 5. Photographs showing the condition of the site at the completion of the works are shown in Appendix I (i) (Volume II).

9.2 Constraints

Any future changes to the current site layout should consider potential constraints as recorded and displayed on the Constraints Plan, presented as Appended Figure 6.

Any change in use of the site, and/or any proposed redevelopment, will require re-assessment of risks associated with land contamination at the site.

9.3 Residual Risk Assessment

Residual contamination from the existing gasholder in the center of the site and other areas of site may remain beyond the extent of the remediation areas. This should be taken into consideration for any future development plans for the site. Surplus material potentially generated during any future development works should be tested as it may require off-site disposal. Given the industrial legacy of the site, it should be assumed that the material may not be inert and therefore may have cost implications for any proposed development.

If the clay wall in Area C is removed and/or damaged the presence of contaminants in groundwater potentially migrating on/off site should be taken into consideration for any future works at, or use of, the site.

A site specific HSSE Plan should be developed for any future works carried out on site in accordance with applicable guidelines and legislation. This Verification Report will be referenced in the Health and Safety File.

9.3.1 Conclusions and Recommendations

Following the completion of the groundwater monitoring programme undertaken at the site, Planning Conditions No. 3 and No. 5 have been met, with no evidence of deterioration in groundwater quality at the site following the completion of the works.

It is noted that the above ground gasholder and associated partially below ground tank remain on site. The wider former gasworks is also located up hydraulic gradient to the north-east of the site.

9.4 Post Remediation Contaminant Linkages

Following the completion of the remedial works it is considered that the pathways, as presented in Table D, have been addressed and therefore the significant contaminant linkages are no longer present.

10. Essential Wayleaves

Cellnex lease part of the site.

Information on underground services is presented on Appended Figure 6 (Constraints Plan).

11. Warranties/Contract Maintenance

Worley Consulting and Erith have provided the warranties stipulated within the Contract documents.

Worley Consulting warrants that the works were conducted with reasonable skill and care according to current standards.

12. Contact Details

Employer SGN, 2 Woodstock Road, Yarnton, OX5 1NY			
Name	**Title**	**Mobile**	**Email**
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Emily Lewis	Project Manager		
Brooke Davison	Supervisor		

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Darren Shephard	Site Agent		

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Arun District Council (Group Head of Planning)	
The Arun Civic Centre, Maltravers Road, Littlehampton, West Sussex, BN17 5LF	
Telephone	**Email**
01903 737756	Planning@arun.gov.uk

13. Health, Safety, and Environment

The Construction Phase Plan (CPP) was prepared by Erith and submitted to SGN, Worley Consulting, and the CDM Advisor (Perses) for review.

The CDM Advisor and SGN confirmed the plan conformed to the requirements of the Construction (Design and Management) Regulations 2015 and issued a Work Commencement Authorisation (WCA).

This Verification Report will be referenced in the Health and Safety File.

A site specific HSSE Plan should be prepared for any future works carried out on site in accordance with applicable guidelines and legislation at that time.

13.1 Accidents, Incidents and Near Misses

During the works no accidents, incidents, near misses, environmental incidents or security issues were reported.

No exceedances by the environmental monitoring equipment for noise, vibration, vapour, dust or odour.

13.2 Health & Safety Audits

Erith carried out an internal health and safety audit on 1 September 2025, which is included in Appendix H (iii) (Volume II). No deviations from the required site policies and procedures were noted.

13.3 Manager's Audit

Erith conducted two internal Manager's Audits on 26 August 2025 and 25 September 2025, respectively, which are included in Appendix H (iii) (Volume II). Two high and two medium deviations from the required site policies and procedures were reported.

13.4 Environmental Audit

Erith conducted an internal environmental audit on 2 September 2025, which is included in Appendix H (iii) (Volume II). No deviations from the required site policies and procedures were noted.

13.5 External Health and Safety & Environment Inspections

13.5.1 CDM-A

SGN's appointed CDM-Advisor (Perses) undertook one Health and Safety and one Demolition Audit visits during the works. Perses deemed Erith and the site as being 'Compliant' with no

significant issues/concerns were identified. Both audits are included in Appendix H (ii) (Volume II).

13.5.2 ISO 14001 Environmental Inspections

One ISO14001 environmental inspection was undertaken onsite on 20 August 2025 by Worley Consulting for Erith. The inspection classified the sites at the time of inspections to be "Good". A copy of the report following closeout of actions is included in Appendix H (i) (Volume II).

14. References

Author	Date	Description
Advisian	2023	Factual Site Investigation Report
Advisian	2024	Additional Trial Pitting Site Investigation
Atkins	2001	Factual Site Investigation Report
British Geological Survey	2025	Geoindex Onshore Viewer https://www.bgs.ac.uk/geological-data/ Accessed September 2025
British Geological Survey	2025a	Hydrogeological Interactive Map https://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSHydroMap
Environment Agency	2026	Environment Agency online "Catchment Data Explorer" https://environment.data.gov.uk/catchment-planning Accessed November 2025
Department for Environment Food and Rural Affairs (DEFRA)	2010	Environmental Permitting Guidance, The Landfill Directive, for the Environmental Permitting (England and Wales) Regulations 2019. Updated March 2010. Version 3.1.
DEFRA	2025	MAGIC Map Application https://magic.defra.gov.uk/MagicMap.html
Harrison & Company	1992	Factual Boundary Survey
Hydrock	2017	Phase 1 Desk Study Review and Phase 2 Factual Report
Russel Thomas	2020	The Manufactured Gas Industry: Volume 2 https://historicengland.org.uk/research/results/reports/redirect/16708
SGN	2019	Specification for Gsaholder Tank Dewatering, Infilling & Reporting, Version 3.3
UK Health and Safety Executive	2015	Construction (Design and Management) Regulations
White Young Green Environmental	1999	Factual Desk Study
Worley Consulting	2024	Data Review & Outline Remedial Strategy
Worley Consulting	2024a	Quantitative Risk Assessment – Derivation of Import Criteria for the Protection of Controlled Waters
Worley Consulting	2025	Project Works Information, Remediation Works – SGN Littlehampton Holder Station, Hardwood Road, Littlehampton (1388P). Ref: 415001-00022_09702

Author	Date	Description
Worley Consulting	2025a	Remediation Design, SGN Littlehampton Holder Station, Hardwood Road, Littlehampton. Ref: 415001-00022_09702
Worley Consulting	2025b	Conditions Planning Response Letter: Environmental Improvement (Remediation) Works at the Former Gasholder Station, Harwood Road, Littlehampton BN17 71U

Appended Figures

Appended Tables