



8. Investigation Results

8.1 Field Observations

8.1.1 Surface Observations

At the time of the current investigation works, the site (delineation area) was vacant and covered with weeds and grass. A timber post and rail is located about 5m to the north of the site, with an access gate way in the chain wire fence located to the east of the site. A significant amount of rail ballast comprising large (up to 150mm) fragments of basalt was observed on the near surface of the site.

8.1.2 Subsurface Observations

Sub surface investigations indicated that fill material underlies the majority of the site to depths of between 0.4 – 2.0m. Based on observation made during the excavation of the test pits, the following observations of the soil profile were noted:

South side of the fence (Gasworks area - TP1 to TP3)

- ▶ FILL – topsoil and sandy gravel with some rail ballast (fragments of basalt up to 100mm). Large fragments of coke and slag up to 200mm were observed at TP1, TP2 and TP3. Large amount of man made debris including full size bricks. Thickness of unit is generally 0.3-0.5m below ground surface;
- ▶ FILL – ashy gravel band comprising sand and ash. Where encountered, the unit was typically 0.2-0.4m thick. Ash was usually coloured black and comprised fragments of coal, coke and slag;
- ▶ FILL – gravelly sand with fine grey ash. Unit was typically 0.1-0.4m thick;
- ▶ CLAY – moderate plasticity, stiff, red with iron cementation along fracture plains. From approximately 0.7m below ground level.

North side of fence (Cleaning Sheds area – TP4 to TP11)

- ▶ FILL – topsoil and sandy gravel with significant amounts of rail ballast (fragments of basalt up to 150mm) comprising approximately 50% of the fill. Thickness of unit is generally in the order of 0.1-0.3m;
- ▶ FILL – ashy gravel. Unlike the ash bands encountered on the southern side of the fence (Gasworks area), ash encountered on the subject site was mixed in with the sandy gravel. Definitive horizons between the black and grey ash were not discernable. Where encountered, the unit was typically 0.2-0.4m thick and was situated above brick walls and a concrete slab encountered beneath;
- ▶ Towards the base of this fill unit, test pitting encountered the remains of former site infrastructure such as brick walls, footings and a concrete slab. The orientation of the brick walls trended approximately north-east to south-west. Backfill material such as ashy gravel, rail ballast and clay was used to backfill between the walls;



- ▶ FILL – ash and clay, low to moderate plasticity, grey with orange and red mottling. Some remnant of the ash / coal / coke backfill of the upper horizons are mixed in with the backfill clay. Numerous underground pipes were also located within the backfill clays.
- ▶ FILL – clay, low plasticity, soft (this unit was observed only beneath the concrete slab in TP9 and TP10).

Test pit logs for all soils penetrated during the current investigation area presented in **Appendix A**.

8.1.3 PID Results

Elevated PID readings (>40ppm) recorded during site works were as follows:

- ▶ TP1 – 0.1-0.3 = 55.9ppm;
- ▶ TP1 – 0.5-0.6 = 47.6ppm;
- ▶ TP4 – 1.5-1.7 = 99.3ppm;
- ▶ TP6 – 0.7-0.8 = 60.2ppm;
- ▶ TP8 – 0.4-0.6 = 68.7ppm.

Generally, PID readings across the delineation area were in the order of 10-20ppm, which would likely represent 'background' levels at the site.

A mild hydrocarbon odour was noted at TP1 in the black ash / gravel band in the upper 0.5m of the profile. Hydrocarbon odours were not observed in any other pits excavated. Of the elevated PID readings noted above, all were analysed for BTEX within the exception of TP4 1.5-1.7m, and concentrations of BTEX compounds were all below laboratory detection limits.

Sample TP4 1.5-1.7m was a sample of clay fill and exhibited no odours, staining or other indication of contamination. A sample from the same test pit at a depth of 0.3-0.4m recorded low (below threshold criteria) concentrations of BTEX, however, that sample was taken in a layer of ashy fill. In addition, the TP6 0.7-0.8m sample was analysed for BTEX with all concentrations were below laboratory detection limits, it was also clay fill and recorded an elevated PID reading of 60.2ppm. Therefore, GHD do not consider the lack of BTEX analysis on sample TP4 1.5-1.7m an issue for the delineation of the TP44 impact (which the findings of previous investigations associated with ashy fill within the surface 0.5m).

It is noted that PID readings were not recorded for natural soils in TP1, and all soils in TP2 due to a malfunctioning instrument. However, this is not deemed to impact on the project outcomes due to the following reasons:

- ▶ Both samples of fill in TP1 and three (two fill and one natural) of the four samples in TP2 were analysed for BTEX, with all results below laboratory detection limits; and
- ▶ Both TP1 and TP2 are located in the former Gasworks area, which will be the subject of separate investigation and remediation works at a later date.



PID readings are presented on the test pit logs in **Appendix A**. PID calibration records are presented in **Appendix B**. Only one day of fieldworks was conducted, therefore the PID was not recalibrated in the field, rather it was used as calibrated by the equipment supplier (and confirmed by the calibration record in **Appendix B**). 'Spot checks' for PID accuracy were completed in the field by placing the tip of the PID in the opening of an isobutylene cylinder. These checks indicated that the PID was functioning correctly, with readings between 99 and 101ppm recorded.

8.2 Soil Sample Results

Soil samples were collected from eleven test pits and analysed for a range of parameters, principally BTEX and also heavy metals, PAHs, TPH and asbestos.

Summarised laboratory results for all analytes are presented in **Summary Tables, Table A** at the rear of the text. Exceedances listed below are presented in **Figure 4**.

NATA certified laboratory results and associated chain of custody documents are presented in **Appendix C**.

8.2.1 Metals

The metal parameters analysed were arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn respectively).

Metal concentrations detected in the four samples analysed were either below the limit of reporting of the laboratory or detected at concentrations well below the HIL(F).

8.2.2 BTEX

BTEX concentrations detected in the 21 samples analysed were either below the limit of reporting of the laboratory or detected at low concentrations below the NSW EPA Sensitive Land Use Threshold ('threshold'), with the exception of the following exceedances:

Sample TP3 – 0.2-0.3m

- ▶ benzene @ 3.2mg/kg (threshold - 1mg/kg); and
- ▶ total xylenes @ 179mg/kg (threshold – 25mg/kg).

BTEX compounds were detected above the limit of reporting of the laboratory but below the thresholds in the following samples:

- ▶ TP3 – 0.2-0.3
- ▶ TP3 – 0.4-0.6
- ▶ TP4 – 0.3-0.4; and
- ▶ TP5 – 0.3-0.4.

8.2.3 TPH

TPH was detected above the threshold in two of the four samples:



Sample TP1 -0.1-0.3m

- ▶ Total TPH @ 9390mg/kg (threshold – 1000mg/kg); and

Sample TP3 – 0.2-0.3m

- ▶ TPH C₆-C₉ @ 150mg/kg (threshold – 65mg/kg); and
- ▶ Total TPH @ 1250mg/kg (threshold – 10mg/kg).

TPH was not detected above the limit of reporting of the laboratory in the other two samples analysed.

8.2.4 PAHs

Total PAHs including B(a)P were detected at various concentrations above the limit of reporting of the laboratory in all four samples analysed. In addition, one sample had the following exceedance of the HIL by an order of magnitude:

Sample TP1 0.1-0.3m

- ▶ B(a)P @ 67mg/kg (threshold – 5mg/kg); and
- ▶ total PAH @ 898mg/kg (threshold – 100mg/kg).

8.2.5 Asbestos

Two samples were submitted for laboratory analysis of asbestos. Results of analysis included:

- ▶ TP7 – 0.4-0.6m: sample comprised soil and rock fragments = no asbestos detected; and
- ▶ ASB1 – sample comprised a fragment of fibre cement sheeting approx 50x50x5mm in size = chrysotile asbestos detected.

8.3 Waste Classification

Results of the analysis of selected samples for TCLP analysis indicate that concentrations of contaminants in the fill / ash bands did not leach under test conditions at concentrations in excess of the TCLP assessment criteria for inert waste. Results of the TCLP analysis are presented in **Summary Tables, Table B** at the rear of this report.

Concentrations of BTEX compounds and metals were detected at levels less than the upper threshold level for inert waste as listed under columns CT1 in Table A3 and SCC1 in Table A4.

However, total PAH, BaP and TPH were detected above the inert waste criteria of the NSW EPA (1999) guidelines in the following samples:

- ▶ TP1 0.1-0.3m (fill and black ash): total PAH @ 898.1mg/kg, BaP @ 67mg/kg and TPH C₁₀ – C₃₆ @ 9390mg/kg;
- ▶ TP1 0.5-0.6 (fill and grey ash): BaP @ 1.3mg/kg; and