

16.1 CONTAMINATED LAND

16.1.1 Area A

The area has historically been used for clay pits and landfill. A colliery is also known to have been present on site.

The ground conditions encountered in the exploratory holes comprised granular and cohesive made ground overlying interbedded glacial till and laminated clays. The made ground varied in thickness between 0.4m and 10.6m. The majority of the made ground is thought to be associated with known landfill operations to the east and west of the A19.

Testing

Thirty-eight samples were tested from Area A:

- Fifteen (39%) samples were taken from the made ground.
- Twenty-three (61%) samples were taken of the natural ground beneath the site.

In addition twelve of the thirty-eight samples tested underwent leachate analysis.

Made Ground

Metal Analysis

One (7 %) arsenic value of 61.6mg/kg was slightly elevated above the Assessment Value of 40mg/kg.

One (7 %) cadmium value of 15.2mg/kg was very slightly elevated value above the Assessment Value for cadmium (15mg/kg).

No other metal element values were above the Assessment Values.

Phytotoxic Elements

Seven (47%) copper values were elevated above the Assessment Value of 130mg/kg. Copper values ranged between 20mg/kg and 2640mg/kg.

Seven (47%) boron (water-soluble) values were elevated above the Assessment Value of 3mg/kg. Boron values ranged between 1mg/kg and 7.1mg/kg.

Four (27%) nickel values were elevated above the Assessment Value of 70mg/kg. Nickel values ranged between 19mg/kg and 153mg/kg.

Inorganic Compounds

Eleven (73%) of the sulphate values were above the Assessment Value of 2000mg/kg. Values for sulphate ranged between 525mg/kg and 32600mg/kg. Five sulphate values ranging between 10500mg/kg and 32600mg/kg were above the ICRL Action levels for landscaped areas of 10000mg/kg. The values were, however below the ICRL Action Level for buildings and hard cover.

No asbestos fibres were found in any of the samples analysed.

The pH of the site was generally neutral with values ranging between 6.7 and 8.5.

Organic Contamination

One (7%) value for total petroleum hydrocarbon was above the Assessment Value of 5000mg/kg with a value of 15200mg/kg. Dependent option testing was carried out on the sample for diesel range organics and petrol range organics. The results of both of these tests were below the Assessment Values of 5000mg/kg. It is considered that the elevated total

petroleum hydrocarbon result may have been due to the presence of batteries, which were recorded in the fill in BH103. Batteries contain acids and solvents that are not in the testing range of the diesel range organics and petrol range organics analysis, but would show on the total petroleum hydrocarbon analysis.

None of the other organic values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions copper and sulphate contamination was leachable.

Natural Ground

Metal Analysis

None of the metal element values were elevated above the Assessment Values.

Phytotoxic Elements

None of the phytotoxic element values were elevated above the Assessment Values.

Inorganic Compounds

Twelve (52%) sulphate samples recorded values above the Assessment Value of 2000mg/kg. Levels of sulphate across the area ranged between <250mg/kg and 10400mg/kg. One sulphate value 10400mg/kg was slightly elevated above the ICRL Action levels for landscaped areas (10000mg/kg). The values were, however, below the ICRL Action Levels for buildings and hard cover.

No asbestos fibres were found in any of the samples analysed.

The pH of the site is generally neutral with values ranging between 7.6 and 8.8

Organic Contamination

None of the organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the natural ground indicated that in laboratory conditions none of the contamination was leachable.

16.1.2 Area B

Howden Dean was known to traverse the area in an east west direction in the late 18th Century, the Dean has since been infilled and culverted. A brewery and iron foundry were also known to have been present in the study area.

The ground conditions encountered in the exploratory holes comprised granular and cohesive made ground overlying alluvium and interbedded glacial till and glacial laminated clays. The made ground varied in thickness between 1.1m and 8.7m. The made ground is thought to be associated with the infilling and culverting of Howden Dean.

Testing

Twenty-five samples were tested in Area B:

- Seventeen (68%) samples were taken from the made ground.
- Eight (32%) samples were taken of the natural ground beneath the site.

In addition thirteen of the twenty-five samples analysed underwent leachate testing.

Made GroundMetal Analysis

Two (12%) arsenic values were elevated above the Assessment Values of 40mg/kg. The elevated values were 44.7mg/kg and 116mg/kg.

No other metal element values were above the Assessment Values.

Phytotoxic Elements

Two (12%) zinc values were elevated above the Assessment Value of 300mg/kg. The elevated values were 303mg/kg and 580mg/kg.

One (6%) copper value of 186mg/kg was elevated above the Assessment Value of 130mg/kg.

Inorganic Compounds

Eight (47%) of the sulphate results were elevated above the Assessment Value of 2000mg/kg. The values for sulphate ranged between <250mg/kg to 14500mg/kg. One Sulphate result of 14500mg/kg was above the ICRCCL Action Level for landscaped areas of 10,000mg/kg. The result was, however below the ICRCCL Action Level for buildings and hard cover.

No asbestos fibres were found in any of the samples analysed.

The pH of the made ground in the area is generally neutral with values ranging between 7.6 and 8.8.

Organic Contamination

No organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, copper and sulphate contamination was leachable.

Natural GroundMetal Analysis

Two (25%) arsenic values were slightly elevated above the Assessment Value of 40mg/kg. Elevated values were 56.6mg/kg and 63.7mg/kg.

No other metal element values were above the Assessment Values.

Phytotoxic Elements

One (13%) boron (water-soluble) result of 13mg/kg, was elevated above the Assessment Value of 3mg/kg.

No other phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Seven (88%) sulphate values were above the Assessment Value (2000mg/kg). Values for sulphate ranged between 694mg/kg and 38600mg/kg. One sulphate value of 38600mg/kg was above the ICRCCL Action Level for landscaped areas (10,000mg/kg). The result was however, below the ICRCCL action level for buildings and hard cover.

No asbestos fibres were found in any of the samples analysed.

The pH of the natural ground was generally neutral with values ranging between 7.1 and 8.4.

Organic Contamination

No organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the natural ground indicated that in laboratory condition arsenic contamination was leachable.

16.1.3 Area C

The area has been historically used as shipyards, boat yards, coke works, aluminium works, and china clay storage area and is currently used by AMEC as an offshore rig repair yard.

The ground conditions encountered in the exploratory holes comprised granular made ground overlying alluvium and overlying glacial till. The depth of made ground across the area ranged between 6.6m and 7.5m. The made ground is thought to be associated with quay wall construction, land reclamation and dredging that took place during the mid 19th Century and early 20th Century. Land reclamation materials were placed behind the quay walls and included sands and gravels from ballast hills and glass making waste.

Testing

Twenty-one samples were tested in Area C:

- Fourteen (67%) samples were taken from the made ground.
- Seven (33%) samples were taken from the natural ground.

In addition six of the twenty-one samples analysed underwent leachate testing.

Made Ground

Metal Analysis

One (7%) arsenic value was elevated above the Assessment Value of 40mg/kg, with a value of 406.8mg/kg.

No other metal element values were above the Assessment Values.

Phytotoxic Elements

One (7%) boron (water-soluble) value of 3.8mg/kg was very slightly elevated above the Assessment Value of 3mg/kg.

One (7%) nickel value of 73mg/kg was very slightly elevated above the Assessment Value of 70mg/kg.

Two (14%) copper values were elevated above the Assessment Value of 130mg/kg. Elevated values were 167mg/kg and 411mg/kg.

Two (14%) zinc values were elevated above the Assessment Value of 300mg/kg. Elevated values were 400mg/kg and 420mg/kg.

Inorganic Compounds

Six (43%) of the sulphate results recorded values above the Assessment Value of 2000mg/kg. Levels of sulphate across the area ranged between <250mg/kg and 9500mg/kg. None of the sulphate results were, however, above the ICRCCL Action Levels for landscaped areas.

No asbestos fibres were found in any of the samples analysed.

The pH of the made ground in the area ranged between neutral 7.7 to alkali 10.

Organic Contamination

No organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, lead and copper contamination was leachable.

Natural GroundMetal Analysis

One (14%) arsenic value was elevated above the Assessment Value of 40mg/kg, with a value of 73.4mg/kg.

No other metal element values were above the Assessment Values.

Phytotoxic Elements

Two (29%) boron (water-soluble) results were slightly elevated above the Assessment Value of 3mg/kg. The values were 9.1mg/kg and 11.1mg/kg.

No other phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Four (57%) sulphate values were elevated above the Assessment Value of 2000mg/kg. The values for sulphate across the site ranged between 478mg/kg and 23900mg/kg. Two sulphate values of 13,600mg/kg and 23,900mg/kg were elevated above the ICRCCL Action Level for landscaped areas of 10,000mg/kg. The results were however, below the ICRCCL Action Level for buildings and hard cover.

No Asbestos fibres were found within the samples analysed.

The pH of the natural ground ranged between neutral 8.5 to slightly alkaline 9.2.

Organic Contamination

None of the organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the natural ground indicated that in laboratory conditions arsenic and sulphate contamination was leachable.

16.1.4 Area D

The area consists of the River Tyne, which is tidal. The river channel is bounded to the north and south by quay walls. The Tyne valley has an extensive industrial history, which includes coal and ore mining, shipbuilding as well as being a major port. It is considered that the extensive industrial history of the valley has impacted on the river sediments.

The impacts of contamination, construction and operation on the water quality and river ecology including fish were assessed in Sections 12, 13 and 14 of the Environmental Statement.

16.1.5 Area E

The following industries have been historically present in the area: coke ovens, timber merchants, saw mills, leather goods manufacturer, a pottery, shipyards and gas works. The area was reclaimed and developed into Riverside Park, which covers the majority of the area.

The ground conditions encountered in the exploratory holes comprised made ground both granular and cohesive in nature, overlying alluvium, and interbedded glacial till and glacial laminated clay. The depth of made ground across the area varied considerably and ranged between 1.2m and 11.6m.

Testing

Forty-eight samples were tested in Area E:

- Thirty-three (68%) samples were taken from the made ground
 - Fifteen (32%) samples were taken of the natural ground beneath the site.
- In addition nineteen of the forty-eight samples analysed underwent leachate testing.

Made Ground

Metal Analysis

Seven (21%) arsenic values were elevated above the Assessment Value of 40mg/kg. Elevated values ranged between 44.4mg/kg and 665mg/kg.

One (3%) cadmium value was slightly elevated above the Assessment Value of 15mg/kg with a value of 21.7mg/kg.

No other metal element values were above the Assessment Values.

Phytotoxic Elements

Four (12%) copper results were elevated above the Assessment Value of 130mg/kg. Elevated values ranged between 413mg/kg and 743mg/kg.

No other phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Twenty-one (64%) of the sulphate results recorded values above the Assessment Value of 2000mg/kg. Levels of sulphate across the area ranged between <250mg/kg and 46600mg/kg. Ten of the sulphate results were elevated above the ICRL Action Level for landscaped areas of 10,000mg/kg. Elevated values ranged between 11900mg/kg and 46600mg/kg. The results were however, below the ICRL Action Level for buildings and hardcover.

No asbestos fibres were found in any of the samples analysed.

The pH of the made ground in the area ranged from acidic (4.3) to slightly alkali (9.1). The acid pH was encountered within the made ground in BH123A and is considered to be a hot spot associated with the gas works laboratory located in this area.

Organic Contamination

None of the organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, copper, zinc, sulphate and acidic pH contamination was leachable.

Natural Ground

Metal Analysis

None of the metal element values were above the Assessment Values.

Phytotoxic Elements

Two (13%) boron (water-soluble) results were slightly elevated above the Assessment Value of 3mg/kg. Elevated values ranged between 3.4mg/kg and 6.1mg/kg.

No other phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Twelve (80%) sulphate results were above the Assessment Values of 2000mg/kg. The sulphate values across the area ranged between 252mg/kg and 54000mg/kg. Five of the sulphate results were elevated above the ICRL Action Level for landscaped areas of 10000mg/kg. Values ranged between 10500mg/kg and 54000mg/kg. One value exceeded the ICRL Action Level for building of 50000mg/kg, however none of the values exceeded the ICRL Action Limit for hardcover.

Four (27%) sulphide results exceeded the Assessment Value of 250mg/kg. Levels across the area ranged between <25mg/kg and 2120mg/kg.

No asbestos fibres were found in any of the samples analysed.

The pH of the natural ground ranged between neutral 7.1 and slightly alkali 9.1.

Organic Contamination

None of the organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the natural ground indicated that in laboratory conditions arsenic and sulphate contamination was leachable.

16.1.6 Area F

The area has been historically used as a colliery with associated railway sidings traversing the area. Residential development and schools occupy the area.

The ground conditions encountered in the exploratory holes comprised, made ground both granular and cohesive in nature, overlying interbedded glacial till and glacial laminated clay. The depth of made ground across the area varied considerably ranging in depth between 0.14m and <4.5m. The made ground is considered to be associated with Jarrow Colliery and railway sidings, historically located on the site.

Testing

Fifty-four soil samples were tested in Area F:

- Twenty-two (41%) were taken from the made ground
- Thirty-two (59%) were taken from the natural ground beneath the site.

In addition nineteen of the fifty-four samples analysed underwent leachate testing.

Made Ground

Metal Analysis

One (5%) arsenic value was slightly elevated above the Assessment Value of 40mg/kg with a value of 58.1mg/kg.

No other metal element values were found to be above the Assessment Values.

Phytotoxic Elements

One (5%) zinc value of 1400mg/kg exceeded the Assessment Values of 300mg/kg.

Two (9%) copper values exceeded the Assessment Values of 130mg/kg. The values for copper ranged between 16mg/kg and 248mg/kg.

No other phytotoxic element values were found to be above the Assessment Values.

Inorganic Compounds

Fifteen (68%) of the sulphate values were above the Assessment Value of 2000mg/kg. Levels of sulphate across the area ranged between 789mg/kg and 13500mg/kg. Three sulphate values were elevated above the ICRL Action Level for landscaped areas of 10000mg/kg. Values ranged between 12600mg/kg and 13500mg/kg. The results however were below the ICRL Action Level for buildings and hardcover.

No asbestos fibres were found in any of the samples analysed.

The pH of the made ground in the area ranged from 5.6 to 8.8.

Organic Contamination

Two (9%) phenol values were slightly elevated above the Assessment Value. The values for phenol across the area ranged between <2mg/kg and 16mg/kg. The elevated phenol values were from TP238, it is considered that these elevated results are associated with the industrial past usage surrounding this area of colliery and railway sidings.

No other organic contamination values were elevated above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, PAH, sulphate and phenol contamination was leachable.

Natural Ground

Metal Analysis

None of the metal element values were above the Assessment Values.

Phytotoxic Elements

Two (6%) zinc values exceeded the Assessment Values of 300mg/kg. The values for zinc ranged between 46mg/kg and 302mg/kg.

No other phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Eighteen (56%) sulphate values exceeded the Assessment Value of 2000mg/kg. Values for sulphate across the area ranged between 379mg/kg and 9880mg/kg. None of the sulphate results were, however, elevated above the ICRL Action Levels for landscaped areas of 10000mg/kg.

No Asbestos fibres were found in any of the samples analysed.

The pH of the natural ground was generally neutral with values ranging between 7.1 and 8.6.

Organic Contamination

One (3%) phenol value very slightly exceeded the Assessment Value of 5mg/kg, with a value of 9mg/kg. The elevated phenol result is from TP238. Elevated phenols were encountered within the made ground in this trial pit, it is considered that the elevated phenol value is associated with the industrial past usage surrounding this area of a colliery and railway sidings.

No other organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the natural ground indicated that in laboratory conditions arsenic, copper and phenol contamination was leachable.

16.1.7 Area G

The area was historically used as farmland. The River Don Salt Marshes underwent infilling during the early 20th Century and have been developed into a recreational park. The southern portal of the existing Tyne Tunnel is to the west.

The ground conditions encountered in the exploratory holes comprised made ground, cohesive and granular in nature overlying alluvium, overlying interbedded glacial till, glacial sand and glacial laminated clay. The depth of made ground across the area varied considerably ranging in depth between 1.3m and 4.8m. The made ground is thought to have been associated with the reclamation and infilling of the River Don Basin.

Testing

Thirteen samples were tested in Area G:

- Eight (62%) samples were taken from the made ground.
 - Five (35%) samples were taken from the natural ground beneath the site.
- In addition five of the thirteen samples analysed underwent leachate testing.

Made Ground

Metal Analysis

None of the metal element values were above the Assessment Value.

Phytotoxic Elements

One (13%) copper value of 368mg/kg was elevated above the Assessment Value of 130mg/kg.

Two (26%) zinc values were elevated above the Assessment Value of 300mg/kg. The elevated values were 347mg/kg and 1100mg/kg.

Inorganic Compounds

Five (63%) of the samples recorded values above the Assessment Value of 2000mg/kg. Levels of sulphate across the area ranged between 1320mg/kg and 8240mg/kg. None of the results however were above the ICRC Action Levels for landscaped areas.

One (13%) sulphide value of 1090mg/kg was elevated above the Assessment Value of 250mg/kg.

No Asbestos fibres were found in any of the samples analysed.

The pH of the made ground in the area ranges between neutral 7.7 to alkali 9.8.

Organic Contamination

One (13%) phenol value was very slightly elevated above the Assessment Value of 5mg/kg with a value of 6mg/kg. It is thought that this could be associated with the infilling of the Don Valley.

No other organic contamination values were elevated above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, copper, zinc and sulphate contamination was leachable.

Natural Ground

Metal Analysis

No metal element values were above the Assessment Values.

Phytotoxic Elements

None of the phytotoxic element values were above the Assessment Values.

Inorganic Compounds

Three (60%) sulphate values were elevated above the Assessment Values of 2000mg/kg. The values for sulphate across the area ranged between 2940mg/kg and 18700mg/kg. One of the sulphate values of 18700mg/kg was elevated above the ICRL Action Level for landscaped areas of 10000mg/kg. All the values however were below the ICRL Action Level for buildings and hardcover.

No asbestos fibres were found within the samples analysed.

The pH of the natural ground in the area ranges between neutral 8.5 to slightly alkaline 9.2.

Organic Contamination

None of the organic contamination values were above the Assessment Values.

Leachate

The results of the leachate testing carried out on the made ground indicated that in laboratory conditions arsenic, copper, zinc and sulphate contamination was leachable.