

A38 Derby Junctions

TR010022

Volume 6

**6.3 Environmental Statement
Appendices**

**Appendix 10.4: PSS Addendum Link
Road K2**

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

April 2019

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A38 Derby Junctions Development Consent Order 202[]

6.3 Environmental Statement Appendices Appendix 10.3: PSS Addendum Link Road K2

Regulation Number	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010022
Application Document Reference	6.3
Author	A38 Derby Junctions Project Team, Highways England

Version	Date	Status of Version
1	April 2019	DCO Application

A38 Derby Junctions

**Preliminary Sources Study Addendum
Link Road K2**

HA GDMS No. 29038

Contents

1.	Introduction	2
2.	Sources of Information and Desk Study.....	2
3.	Field Studies	2
3.1	Principal Earthwork Inspections	2
4.	Site Description	2
4.1	Site Walkover	2
4.2	Published Geology	3
4.3	Existing Ground Investigation Information	3
4.4	Hydrological, Hydrogeological and Geo-Environmental Information.....	4
4.5	Historical Development & Man-Made Features	5
4.6	Mining, Gypsum and Mineral Extraction	6
5.	Ground Conditions	6
5.2	Topsoil.....	6
5.3	Artificial Ground.....	6
5.4	Superficial Deposits	7
5.5	Bedrock Geology.....	7
5.6	Groundwater	7
5.7	Ground Chemistry	7
6.	Preliminary Engineering Assessment	7
6.1	Cuttings	7
6.2	Embankments	8
6.3	Subgrade.....	8
6.4	Structure Foundations.....	8
6.5	Contaminated Land / Soil Chemistry.....	8
6.6	Construction Issues.....	9
6.7	Existing Geotechnical Problems	10
7.	Comparison of project options and risks	11
7.1	Summary of Desk Study Findings.....	11
7.2	Geotechnical Risk Register.....	11

1. INTRODUCTION

- 1.1.1 Link Road K2 (Kingsway Park Close Link) is proposed to connect the eastern roundabout of Kingsway Junction to Kingsway Park Close (see Figure 1). The proposed link passes at-grade behind the existing Kingsway Retail Park and in a cutting across a historic landfill site.
- 1.1.2 As project-specific ground investigation has yet to be carried out, this preliminary information is based on available published information and historical borehole data. Further ground investigation is proposed to allow incorporation into the detailed design phase.
- 1.1.3 This document, relevant to Link Road K2 only, is an Addendum to the main Preliminary Sources Study 47071319-URS-08-RP-GE-003.

2. SOURCES OF INFORMATION AND DESK STUDY

- 2.1.1 For sources of information refer to Preliminary Sources Study 47071319-URS-08-RP-GE-003.

3. FIELD STUDIES

3.1 Principal Earthwork Inspections

- 3.1.1 For details of Principal Earthwork Inspections refer to Preliminary Sources Study 47071319-URS-08-RP-GE-003. The southern extent Earthwork EMB: 7_A38_37774 is located immediately adjacent to the western extent of the K2 link road but the two should have no significant interaction.

4. SITE DESCRIPTION

4.1 Site Walkover

- 4.1.1 A site walkover was undertaken on the 21st January 2016 to identify current land use and potential issues that may require further investigation.
- 4.1.2 A series of photographs were taken to record the layout of the area. The photographs are presented in Appendix A.
- 4.1.3 The site is located to the north west of the Sainsbury's supermarket at Kingsway Retail Park (HA514503-URS-08-DR-GE-00.001 Site location plan). The A5111 is located to the west of the site, Kingsway Park Close is present to the north east, and Kingsway Retail Park is in the south of the site.
- 4.1.4 The site is situated behind the supermarket and is accessible via a gate and track from the storage yard to the rear of the supermarket. The track is approximately 1.8m wide, which may constrain access to the site from this direction by typical ground investigation equipment.
- 4.1.5 There is public access to the area via a path along the exterior western edge of the store and the site which continues northwards towards Kingsway roundabout.

- 4.1.6 The area is grassed with occasional shrubs and trees. The shrubs and trees become extremely dense towards the northern end and eastwards in the location of the infilled disused railway near the northern edge of the former landfill.
- 4.1.7 As the site extends northwest towards the Kingsway roundabout, at a distance of approximately 55m (from the rear of the supermarket), the shrubs start to become very dense. The elevation of the site rises from the southern point towards the north and levels slightly before falling steeply towards the east (at approximately 70m from the rear of the supermarket in the vicinity of the disused railway line).
- 4.1.8 During the walkover what appeared to be three venting stacks and four monitoring wells were noted within the site. It is likely that these are associated with the presence of part of the former Rowditch Landfill site.
- 4.1.9 Horticultural maintenance of the area is administered by the management of Sainsbury's supermarket.

4.2 Published Geology

- 4.2.1 This section has previously been described in the HA GDMS No. 28093, A38 Derby Junctions, Preliminary Sources Study, March 2015.
- 4.2.2 Kingsway Junction and K2 Link Road is underlain by rocks of the Mercia Mudstone Group: the Sidmouth Mudstone Formation, Gunthorpe Member (formerly Keuper Marl) and the Tarporley Siltstone Formation (formerly Waterstones). The Sidmouth Mudstone Formation includes beds of grey-green dolomitic siltstone, and the Tarporley Siltstone Formation includes beds of fine grained sandstone (known as "skerries").
- 4.2.3 The geological map(Refs 5 & 6) describes the Gunthorpe Member as red-brown to grey-green gypsiferous mudstone with beds of grey-green dolomitic siltstone. The Taporley Siltstone Formation is described as red-brown and green mudstone and siltstone with beds of fine grained micaceous sandstone.
- 4.2.4 Superficial deposits in the vicinity comprise Alluvium and River Terrace Deposits (Allenton Sand and Gravel Member). Made Ground and Infilled Ground are also identified.
- 4.2.5 The Memoir(Ref 7) describes the "Waterstones" as containing a "preponderance" of laminated, silty and sandy beds. The "Keuper Marl" is described as comprising of predominantly blocky red-brown mudstones, with sporadic green beds and patches interlaminated and interbanded pale grey siltstones. Some of the thicker more persistent siltstones combine to form "skerries". Some "skerries" are of sand grade and cemented by dolomite.
- 4.2.6 The Memoir notes that evaporites (gypsum and anhydrite) in the Keuper Marl are confined to secondary veins, stringers and nodules. Sulphate solution in the surface beds leaves numerous small cavities and collapse-structures. The depth of the solution zone increases in the vicinity of faults.

4.3 Existing Ground Investigation Information

- 4.3.1 For details of existing ground investigation information refer to Preliminary Sources Study 47071319-URS-08-RP-GE-003.

4.4 Hydrological, Hydrogeological and Geo-Environmental Information

Hydrology:

- 4.4.1 There are no Water Framework Directive River Basin Management Plans for Rivers and Lakes located near to the K2 Link Road.
- 4.4.2 The nearest surface water feature to the site is Bramble Brook, approximately 155m west of the site, within and immediately to the south of the current Kingsway junction. Bramble Brook is partly culverted in the area of the existing Kingsway junction, and flows in a northerly direction towards the junction, before heading in an easterly direction. There are no surface water extractions, or monitoring by the Environment Agency of water quality within Bramble Brook.
- 4.4.3 The Environment Agency website (reviewed 26/01/2016) indicates on their flood risk mapping that there is a very low risk of flooding at the site.

Hydrogeology:

- 4.4.4 There are no superficial deposits underlying the K2 Link but Alluvium is located near its northern extent. The bedrock deposits underlying the site are classified by the Environment Agency as Secondary 'B' aquifer (Mercia Mudstone Group – Mudstone), which is predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. The Environment Agency website (reviewed 26/01/2016) WFD River Basin Management Plans for Groundwater indicates that Kingsway Junction overlies the Derwent – Secondary Combined water body.

Geo-Environmental:

- 4.4.5 The Envirocheck Report (60387304_1_1, 18/09/14) shows the historic landfill site called 'Rowditch Tip'. The Environment Agency identifies the site operator as Par Development Limited. 'Rowditch Tip' is stated to have been operated between 31 December 1900 and 02 September 1991. However, a 'Refuse Tip' is first shown at this location on Ordnance Survey maps dated 1967 and 1972, which implies that the first input date may be incorrect. The landfill has a 'last input date' of 02 September 1991. The licence holder is recorded as J Sainsbury Plc and Leigh Interests Plc, under reference number LD02. The Environment Agency identifies previous licence holders for the 'registered landfill site at Rowditch' as Derby Waste Disposal Ltd (record superseded in 1977) and Leigh Environmental Ltd (licenced lapsed/cancelled/defunct/not applicable/surrendered in 1986) both under licence reference number LD02.
- 4.4.6 The landfill accepted the following wastes: inert; industrial; commercial; household; special waste and liquid sludge. However, no information gives any indication as to whether certain waste streams were deposited in certain areas. Also from the available information, there is no indication of that a basal landfill liner or a properly engineered barrier system is present at the landfill.

- 4.4.7 During the ownership of Derby Waste Disposal Co Ltd wastes deposited at the site included; alkali metal oxides/hydroxides, asbestos, construction and demolition wastes, dyestuffs waste, fats, waxes and greases, food processing wastes/starch, glue wastes, halogenated cleaning compounds, house and commercial untreated wastes, industrial non-hazard waste, industrial effluent treatment sludge, interceptor pit wastes, ion exchange resin wastes, iron compounds, latex, latex rubber solutions and suspensions, lead compounds, metal scrap, mineral oils, mineral processing wastes, other alkalis, other inorganic materials, other non-toxic metal compounds, paint wastes, polymeric material and scrap products, printing industry wastes/ink, scrap rubber (including tyres) silt and dredgings, slag boiler/flue cleanings, soaps and detergents, synthetic adhesive wastes, tank cleaning sludge, tar, pitch, bitumen, asphalts, used filter materials, vanadium compounds and waste treated timber.
- 4.4.8 Construction and demolition wastes including solid asbestos pipes and sheets were deposited under the ownership of Leigh Environmental Limited. The site of the former 'Rowditch Tip' has since been redeveloped as a retail park.
- 4.4.9 It was noted during a recent site walkover that a number of landfill gas monitoring wells and gas vents were present at the site. This indicates that landfill gas is (or has been) managed at the site. Where possible ground gas concentrations and flow rates should be recorded within these monitoring wells and gas vents prior to the proposed ground investigation.
- 4.4.10 The route of a dismantled railway line is also noted as a historic landfill in the wider area, located to the west of the main Kingsway Junction. The historic landfill is called 'Disused Railway Cutting and Tunnel off Station Road' and was operated by Northern Land Agriculture Improvements Limited. This site received inert waste between 31 August 1981 and 31 March 1993. The former railway is close to the edge of the Rowditch tip at the northern extent of the K2 link road.
- 4.4.11 Two pollution incidents to controlled waters are recorded in the Envirocheck report (60387304_1_1, 18/09/14) at the Kingsway junction. An incident in February 1998, involving a Road Traffic Accident, caused 682 litres of milk to flow into the drains. The incident was classed by the Environment Agency as Category 1 – Major Incident. The second incident took place in February 1999 where an accidental spillage of oils (diesel) occurred. The incident was classed by the Environment Agency as a Category 3 – Minor Incident. Both incidents impacted the catchment area of the Markeaton Brook.

4.5 Historical Development & Man-Made Features

- 4.5.1 As indicated in HA GDMS No 28093 Preliminary Sources Study March 2015 historical maps show that in 1886 the site was part of fields. The Great Northern Railway Line (Derbyshire & North Staffordshire Extension) was located near the northern edge of the K2 Link Road, crossing the area in an east west direction. Bramble Brook ran adjacent to the northern edge of the railway line. Thornhill Farm and Humbleton Farm were located approximately 250 m to the east and west of the site respectively, and the brickyard is visible on the 1886 map. On the 1901 map the brickyard excavation areas are shown (Ordnance Survey mapping legend indicates a Quarry or Clay/Chalk pit), extending south and west towards the site within 250 m of the boundary of the site.
- 4.5.2 By 1972 the Quarry / Clay pits have been in filled. The Kingsway Junction was constructed between 1972 and 1975, by which time the railway had been dismantled.

- 4.5.3 The superstore is shown to lie immediately to the south east of the area of the K2 Link Road by 1989 upon the in-filled Quarry / Clay Pits. The 1992 map labels the in-filled Quarry / Clay Pits to be a disused tip. The 2000 map shows the disused tip has become a retail park.

4.6 Mining, Gypsum and Mineral Extraction

- 4.6.1 Coal Mining is not recorded to have been undertaken beneath the site.
- 4.6.2 There are no recorded occurrences of man-made mining cavities or natural cavities within the area. Although there is recorded a very low potential for collapsible ground stability hazards within the Envirocheck report (60387304_1_1, 18/09/14).
- 4.6.3 The site is situated directly upon the Rowditch Brick Works which has ceased to operate. The Rowditch Brick Works was a quarry extracting clay and shale. The quarry was later used for landfilling, see paras 4.4.5 to 4.4.8.

5. GROUND CONDITIONS

- 5.1.1 For details of the ground conditions around Kingsway Junction and of the wider site area, refer to Preliminary Sources Study 47071319-URS-08-RP-GE-003.
- 5.1.2 General ground conditions in the vicinity of the Link Road K2 are anticipated to comprise topsoil and Made Ground underlain by rocks of the Mercia Mudstone Group. It is expected that much of the Made Ground will consist of Landfill waste from the historic landfill site and the dismantled railway.

5.2 Topsoil

- 5.2.1 Topsoil was encountered in the majority of historic exploratory holes to a thickness of up to 0.61 m, although typically in the range 0.2-0.4 m. The Topsoil is typically described as grey to brown, sometimes with brick and ash

5.3 Artificial Ground

- 5.3.1 Historic landfills are present on the site, which are expected to include inert, industrial, commercial, household waste materials. The types of waste recorded to have been deposited at the site include:-
- Inert Wastes such as glass, concrete, bricks, tiles, soils and stones were deposited at all historical landfills;
 - Industrial wastes such as waste from a factory or industrial process were deposited at the Rowditch Tip and Kingsway Industrial Estate sites;
 - Commercial wastes such as waste from premises used wholly or mainly for trade business, sport, recreation or entertainment were deposited at the Rowditch Tip and Kingsway Industrial Estate sites;
 - Household waste (deposited only at Rowditch Tip): This includes wastes from dwellings of types – houses, caravans, prisons, schools, colleges and universities;

- Special waste (deposited only at Rowditch Tip): This includes waste with hazardous properties and may be flammable, irritant, toxic, harmful, carcinogenic or corrosive;
- Liquids / sludge: this includes industrial wastewater, sewage sludge and chemical wastes mixed with municipal solid waste deposited at the Rowditch Tip.

5.3.2 At this stage the distribution of the waste types across the historic landfill sites is not known and it is unclear if boundaries exist between the different types of waste or not. There are no records of waste control measures within the Rowditch Tip and Kingsway Industrial Estate landfill sites (including liner or capping details). According to the EA, there is evidence that gas control measures may have been implemented at disused railway at some point.

5.3.3 The link road route also crosses a dismantled former railway, which runs along the northern edge of the Rowditch Tip.

5.4 Superficial Deposits

5.4.1 No significant superficial deposits are anticipated beneath the majority of the historic landfill. A strip of Alluvium is indicated running south-west to north-east through the Junction, intercepting the northern extent of the proposed link.

5.5 Bedrock Geology

5.5.1 Artificial and superficial ground is underlain by rocks of the Mercia Mudstone Group. A fault, trending south-east to north-west, is inferred approximately 50m north of the proposed link.

5.6 Groundwater

5.6.1 Groundwater levels were recorded as being approximately 0.5 to 1.5m depth below original ground level (1968), which may now be several metres below current embankment surface levels. However, the land surrounding the junction may be subject to near-surface groundwater levels.

5.7 Ground Chemistry

5.7.1 Ground chemistry information was recorded for the 2005 investigation within Made Ground materials in the Kingsway Junction Area:

- pH – 7.0 to 9.4
- SO₄ Total (mg/kg) – 181 to 1380

6. PRELIMINARY ENGINEERING ASSESSMENT

6.1 Cuttings

6.1.1 Due to the cutting going through historic Landfill it is proposed that within the road corridor the ground be excavated to 2m below the road level, which is proposed to be approximately 5m below current ground level. This will be replaced with compacted clean fill to 2 m below road corridor. Within the fill the cutting slopes are recommended with a maximum slope gradient of 1(v):2.5(h). Excavated material from Landfill will be tested and compared against re-use acceptability criteria. This

material will either be re-used in the works; or treated and re-used in the works; or disposed to a permanent Landfill.

- 6.1.2 The former landfill material is recommended to be graded with a maximum slope of 1(v):4(h) from the base of excavation, with an appropriate liner / cap system put in place. The interaction between chemical and physical stability will be considered during detailed design, following ground investigation.
- 6.1.3 The proposed proposed liner / cap system for the historic landfill should comprise clay liner, an impermeable membrane, and a granular gas venting layer with the waste material contained inside.
- 6.1.4 Ground gas / groundwater monitoring wells should be installed to monitor concentrations of gases and groundwater in the vicinity of the cut.
- 6.1.5 Cutting crest and toe drainage should be provided. Crest drainage could be provided by open ditch or granular filter drains, whereas toe drainage should be provided by granular filter drains due to the close proximity of the carriageway.
- 6.1.6 Topsoil thickness of 250mm max. is recommended for slope gradients of 1(v):2.5(h). Where an increased thickness is required for tree planting, individual tree pits should be provided.

6.2 Embankments

- 6.2.1 Embankment construction is not proposed for the K2 Link Road.

6.3 Subgrade

- 6.3.1 The pavement founding material is likely to be predominantly reconstructed within the historic landfill cutting and will therefore be dependent on the characteristics of fill material selected. Based on the potential use of site won Mercia Mudstone a CBR value of 3 to 4% is anticipated. Localised sub-formation treatment for soft spots is likely to be required, especially within the tie-in between the Kingsway eastern roundabout and the historic landfill, and alluvial material at the northern end of the link.
- 6.3.2 Tie-in to existing carriageway construction may dictate the thickness of construction layers, e.g. to provide continuity of cross-carriageway drainage within granular layers.

6.4 Structure Foundations

- 6.4.1 No specific requirements identified.

6.5 Contaminated Land / Soil Chemistry

- 6.5.1 The Link Road K2 (Kingsway Park Close Link) cuts through a historical landfill site east of A38. This landfill is identified by the Environment Agency (EA) as 'Rowditch Tip', Kingsway Industrial Estate.
- 6.5.2 At this stage the distribution of the waste types across the hisoric landfill sites is not known and it is unclear if boundaries exist between the different types of waste or not. There are no records of waste control measures within the Rowditch Tip and Kingsway Industrial Estate landfill sites.

- 6.5.3 The K2 area was part of a former brick clay quarry, likely landfilled in the 1960's and 1970's. At the time it is likely that the remaining clay and/or weathered mudstone materials would have been considered a very good base for the landfill. There is no indication from the information available that a basal landfill liner (membrane) is present. Apart from information on what waste materials the various landfill operators were licensed to accept, no information has been found which gives any indication as to whether certain waste streams were deposited in particular areas. It is likely that industrial waste would have been deposited next to domestic waste. Landfills of the era would have been operated on a co-disposal, dilute and disperse model.
- 6.5.4 The previous Ground Investigation by Pam Brown Associates in 2015 did not encounter elevated contaminant concentrations in comparison to assessment criteria for a commercial end use. However asbestos containing materials (lagging and fibre clumps) were identified in the one borehole of the former landfill area within the investigation. No groundwater or perched groundwater was encountered during the GI.
- 6.5.5 Based on the information available the presence of asbestos containing material will be the main liability, in respect to potential exposure of people and land surrounding the cut area during excavation works and in regards to re-use of excavated material and whether it would have to be re-landfilled at a hazardous waste facility.
- 6.5.6 The hydrogeological conditions including the groundwater level, ground flow direction, groundwater flow rate beneath the site are unknown at this stage.

6.6 Construction Issues

- 6.6.1 The site is considered as 'Brownfield Land' as it does not have an environmental permit (licence) and would follow UK government guidelines and industry best practice for work on such sites. The landfilled area has previously been built upon (ca. 1987) which would imply there are no apparent significant issues related to long term liability noted.
- 6.6.2 The variety of ground conditions and historical land use has identified a number of potential geotechnical and geo-environmental problems that will require assessment and may require remedial treatment or mitigation during construction, as follows:-
- 6.6.3 Soft and compressible alluvial deposits and soft near-surface ground conditions. These may have implications for pavement sub-grade and require appropriate foundation types.
- 6.6.4 Remnants and potential contamination may be present, associated with the dismantled railway.
- 6.6.5 Made Ground material may be contaminated, soft and compressible, which may have implications for excavation, pavement sub-grade and require appropriate foundation types.
- 6.6.6 Potential to encounter fault-disturbed material within the extent of the proposed link. If found, this may require remedial treatment, such as partial excavation and replacement.

- 6.6.7 Anticipated high groundwater levels, which may have implications for foundation excavation, pavement sub-grade and cutting excavation, requiring interception by slope face drainage as well as crest and toe drainage.
- 6.6.8 Potential for soil contamination associated with the historic landfills present on the site. Cut materials may not be acceptable for re-use within the scheme and may require treatment and/or offsite disposal.
- 6.6.9 Potential historic landfill leachates that may be generated and may impact the groundwater and surface water features in the site vicinity. Potential contaminants in soil and/or historic landfill leachate may include metals, other inorganic contaminants, TPHs, PAHs, VOCs and SVOCs.
- 6.6.10 Potential for landfill gas (methane and carbon dioxide) concentrations to be generated from the historical landfill present along the route of the proposed link. However removal of the landfilled material by the construction of the cutting wall will reduce the source of ground gas.
- 6.6.11 Reconnaissance monitoring rounds of the existing installations will be undertaken to obtain information on the ground gas concentrations, flow rates, depth to base of installations, depth to groundwater (where present). Additional monitoring will also be undertaken during the ground investigation works.
- 6.6.12 Exposure of humans, controlled water and other receptors to contamination;
- 6.6.13 Potential for excavations to impact the groundwater regime, particularly if cuttings extend below groundwater level, creating other preferential pathways for contaminant migration. Dewatering of the excavation and treatment of pumped water may be required before disposal.
- 6.6.14 Controlled excavation and transport of cuttings is advised in order to prevent the uncontrolled release of contaminants to the environment.
- 6.6.15 Excavated soil should be sorted, treated and reused at the site where possible to minimise offsite disposal, subject to acceptability of material.
- 6.6.16 Ground gas monitoring equipment should be provided to monitor concentrations of oxygen, methane, carbon dioxide, carbon monoxide, hydrogen sulphide and other toxic gases where workers are required to enter confined spaces.
- 6.6.17 The installation of gas protection will be required within drainage runs to prevent collection and/or lateral migration of ground gases. Such protection can include the use of a gas-proof membrane in the base and sides of drainage runs for the length where it crosses the former landfill.

6.7 Existing Geotechnical Problems

- 6.7.1 Not used. Refer to section 6.6.

7. COMPARISON OF PROJECT OPTIONS AND RISKS

7.1 Summary of Desk Study Findings

- 7.1.1 Discussion of potential issues and possible engineering solutions for different construction elements are given in Section 6. The following sections summarise the principal risks.
- 7.1.2 This report does not cover aspects related to existing services, which may require avoidance or diversion.
- 7.1.3 The current Kingsway junction roundabout is situated on embankment and at-grade, with a depression in the centre of the roundabout relative to carriageway level, crossed by the channels for Bramble Brook. Approaches to the roundabout are in cut, at-grade and on embankment. The Junction is surrounded by industrial and retail parks, college with sports grounds, open grassland and residential development. The proposed link road is to the east of the roundabout, with a supermarket to the west and numerous public footpaths in the area.
- 7.1.4 Ground conditions are anticipated to comprise Topsoil; artificial ground including Made Ground (in particular landfill waste); superficial deposits including Alluvium; underlain by rocks of the Mercia Mudstone Group.
- 7.1.5 Soft and compressible alluvial deposits (including peaty soils) have been inferred and soft near surface ground conditions have been identified.
- 7.1.6 Remnants and contamination associated with the dismantled railway may be present.
- 7.1.7 High groundwater levels are anticipated. In the historic landfill area, leachate is also likely to be encountered.
- 7.1.8 Site space constraints from adjacent infrastructure and supermarket may restrict the working area for constructing the link-road cutting and associated landfill liner system.
- 7.1.9 Voided ground (e.g. dissolution of gypsum) may be present.
- 7.1.10 Soil contamination may be present in Made Ground materials used to construct embankments.
- 7.1.11 Soil contamination may be present in areas of the two historic landfills crossed by the link road
- 7.1.12 Historic landfills may be sources of ground gas and/or groundwater pollution.

7.2 Geotechnical Risk Register

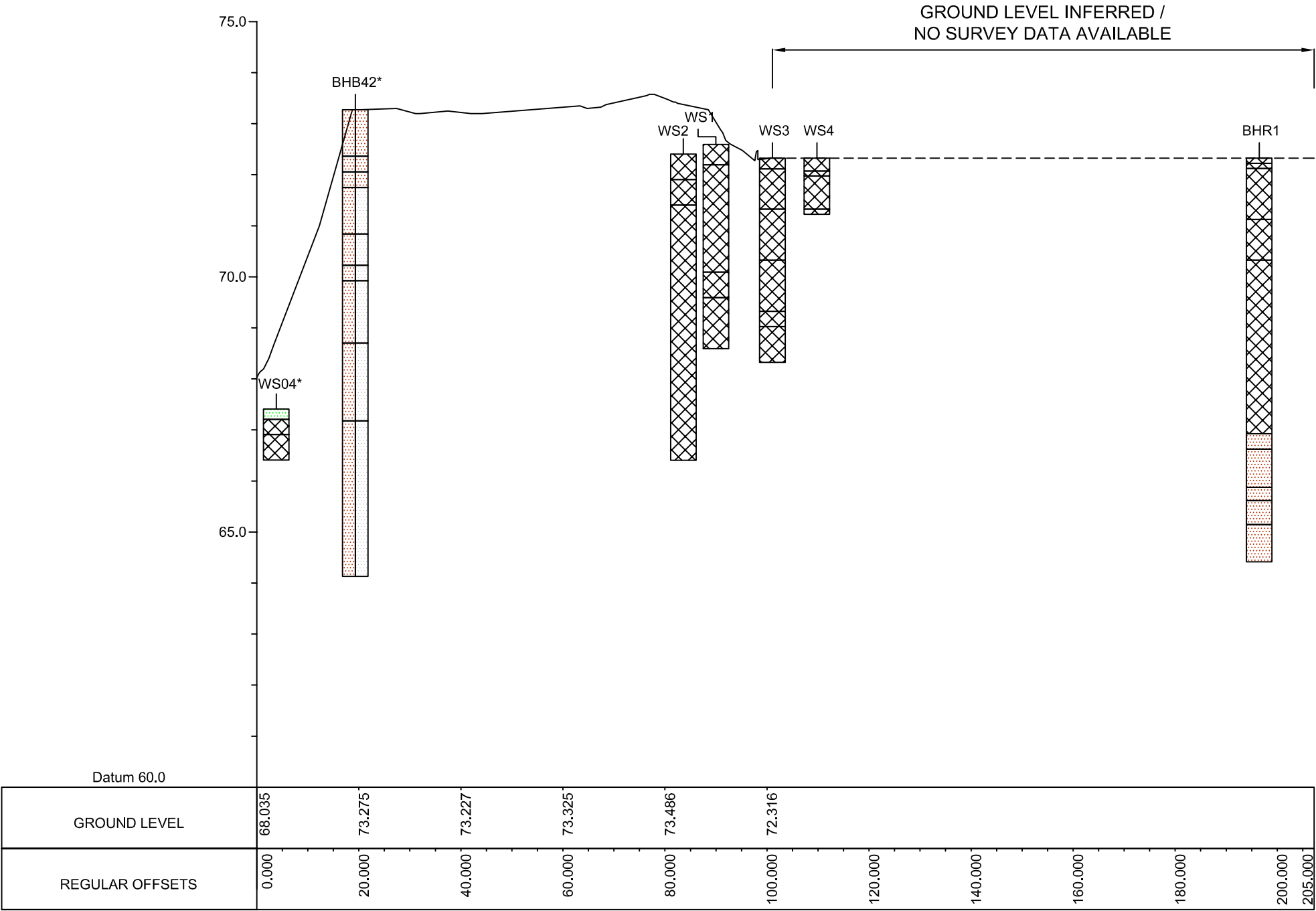
- 7.2.1 The geotechnical risk register is presented in Table 7.1.

	Hazard / Risk (Principal location given in brackets)	Consequence	Before Control			Control
			P	I	R	
1	Ground Conditions:					
1.1	Soft / compressible ground. Structures (Kingsway).	Founding stratum does not meet strength requirements. Increased foundation size / depth required.	2	4	8	Undertake targeted ground investigation.
1.2	Depth to suitable bearing stratum for structure foundations greater than anticipated.	Deeper foundations required, possibly with mobilisation of alternative plant.	2	4	8	Undertake ground investigation.
1.3	Rockhead / hard strata encountered at shallower depth than anticipated.	Interception of hard strata during excavation / structure piled foundation construction. Excavation / construction progress reduced. Inappropriate plant on site to carry out excavation.	2	3	6	Undertake ground investigation.
1.4	Soft / unsuitable material at pavement formation level.	Short-term trafficability problems. Increased construction thickness required.	3	2	6	Include as part of ground investigation. Allowance for excavate and replace / treatment.
2	Groundwater Conditions:					
2.1	Refer to section 3.3 and 3.4.	Refer to section 3.3 and 3.4.				Refer to section 3.3 and 3.4.
3	Contamination:					
3.1	Contaminated material. Historic landfill site	Materials landfilled in area of K2 Link Road contain significant proportion of hazardous materials.	4	5	20	Undertake targeted contamination ground investigation. Further testing and risk assessment. Remediation of contaminated material if required (e.g. in situ treatment or removal).
3.2	Landfill/ground gas	Possible elevated ground gas concentrations resulting in hazardous conditions during construction works. Potential for migration of landfill gases through sides of cutting resulting in nuisance odours	3	4	12	Undertake targeted contamination ground investigation, install ground gas monitoring well, monitor ground gas concentrations and flow rates, obtain gas samples for analysis and undertake risk assessment.
3.3	Contaminated Groundwater/Landfill Leachate	Landfill leachate migrated into underlying ground materials and groundwater due to breach of landfill liner or no landfill liner present. If groundwater requiring remediation potential delay to construction works.	3	4	12	Undertake targeted contamination ground investigation, install groundwater monitoring well, sample for chemical analysis and undertake risk assessment.

	Hazard / Risk (Principal location given in brackets)	Consequence	Before Control			Control
			P	I	R	
3.4	Contaminated Groundwater/Landfill Leachate	Landfill leachate present at significant volumes requiring dewatering of K2 cutting. Water from dewatering activity requires treatment/processing. EA does not allow Environmental Permit to discharge water.	3	4	12	As 3.4.
4	Ground Chemistry:					
4.1	Ground chemistry / solution features.	Ground conditions aggressive to concrete and steel products. Pavement heave. Voids / softened material (e.g. resulting from dissolution of gypsum) leading to collapse / increased settlement of earthworks and structures.	3	3	9	Undertake targeted ground investigation and testing for aggressive ground conditions and solution features.
5	Re-Use of Material:					
5.3	Contaminated material. Re-use of materials	Excavated material is contaminated and requires treatment before re-use as general fill, restrictions on its re-use or cannot be re-used within the scheme and identified as hazardous material.	4	4	16	Undertake further testing / risk assessment of material acceptability for re-use
6	Site Conditions:					
6.1	Space constraints resulting in inability to construct foundations or cutting	Site space constraints of working adjacent to existing infrastructure and supermarket may restrict the number of foundation construction options it is possible to consider (e.g. large excavations for spread footings and pile construction on existing sloping ground).	3	3	9	Consider outline temporary works and space requirements for the construction stage.
6.5	Existing structure foundations.	Interception of existing foundation during foundation excavation / installation and cutting excavation.	3	2	6	Review applicable as-built information during design and undertake investigations if necessary.
6.6	Existing services, in particular those installed after previous studies.	Services require diversion and/or protection.	2	3	6	Review applicable information during design and undertake ground investigation where necessary (e.g. for trenchless crossings).
Risk (R) = Probability (P) x Impact (I)						
Probability:						
Impact:						
Very Likely	5	Very High	5			
Likely	4	High	4			
Probable	3	Medium	3			
Unlikely	2	Low	2			
Negligible	1	Very Low	1			

Figures

Plot Date : 21 April 2016 16:42:40
File Name : JCH-WIP-001\CH_GEOTECHNICS\47071637 A38 DERBY JUNCTIONS\2-0 PROJ INFO\2-3 DOCS\CAD_DATA\ALTERNATIVE OPTIONS\KINGSWAY OPTION K1 K2\FIGURE 02



Project Title
A38
DERBY JUNCTIONS

Highways England
Major Projects
The Cube
199 Wharfside Street
Birmingham
B1 1RN



Drawing Title
LONG SECTION

Purpose of issue				
FOR INFORMATION				
Designed	Drawn	Checked	Approved	Date
	SDW	DMG	SAC	
AECOM Internal Project No. 47071637			Suitability	
Scale @ A3 1:1000			Zone / Mileage	

THIS DOCUMENT HAS BEEN PREPARED PURSUANT TO AND SUBJECT TO THE TERMS OF AECOM' APPOINTMENT BY ITS CLIENT. AECOM ACCEPTS NO LIABILITY FOR ANY USE OF THIS DOCUMENT OTHER THAN BY ITS ORIGINAL CLIENT OR FOLLOWING AECOM' EXPRESS AGREEMENT TO SUCH USE, AND ONLY FOR THE PURPOSES FOR WHICH IT WAS PREPARED AND PROVIDED.

AECOM
Royal Court, Basil Close
Chesterfield
Derbyshire, S41 7SL
Telephone: (01246) 209221
Fax: (01246) 209229
www.aecom.com



Drawing Number
FIGURE 02

Rev

Appendices

Appendix A

Site Walkover Photographs



PLATE 1A: Gate access to site at rear of supermarket



PLATE 1B: View North West towards Kingsway Junction and the A5111

Plot Date : 21 April 2016 12:40:05
 File Name : K:\47071637 A38 DERBY JUNCTIONS\2-0 PROJ INFO\2-3 DOCS\CAD_DATA\A38 PSS LINK ROAD PLATES\PLATES 1-3


Drawing Title A38 DERBY JUNCTIONS PSS LINK ROAD K2 PLATES 1A & 1B	Purpose of issue FOR INFORMATION			
	Drawn SDW	Checked DMG	Approved	
	Date	Scale @ A4 N/A	Rev	
	Drawing Number PLATE 1			



PLATE 2A: View of the public access along south eastern perimeter of supermarket



PLATE 2B: Public access route West of the site towards the A5111

Plot Date : 21 April 2016 12:40:31
File Name : K:\47071637 A38 DERBY JUNCTIONS\2-0 PROJ INFO\2-3 DOCS\CAD_DATA\A38 PSS LINK ROAD PLATES\PLATES 1-3



<div>Drawing Title</div> <div>A38 DERBY JUNCTIONS</div> <div>PSS LINK ROAD K2</div> <div>PLATES 2A & 2B</div>	<div>Purpose of issue</div> <div>FOR INFORMATION</div>			
	<div>Drawn</div> <div>SDW</div>	<div>Checked</div> <div>DMG</div>	<div>Approved</div>	
	<div>Date</div>	<div>Scale @ A4</div> <div>N/A</div>	<div>Rev</div>	
	<div>Drawing Number</div> <div>PLATE 2</div>			



PLATE 3: View looking towards northern perimeter of the site towards the disused railway

Plot Date : 21 April 2016 12:41:00
 File Name : K:\47071637 A38 DERBY JUNCTIONS\2-0 PROJ INFO\2-3 DOCS\CAD_DATA\A38 PSS LINK ROAD PLATES\PLATES 1-3

<div>Drawing Title</div> <div>A38 DERBY JUNCTIONS</div> <div>PSS LINK ROAD K2</div> <div>PLATE 3</div>	<div>Purpose of issue</div> <div>FOR INFORMATION</div>			
	<div>Drawn</div> <div>SDW</div>	<div>Checked</div> <div>DMG</div>	<div>Approved</div>	
	<div>Date</div>	<div>Scale @ A4</div> <div>N/A</div>	<div>Rev</div>	
	<div>Drawing Number</div> <div>PLATE 3</div>			