

Land to the South of Wilmslow Old Road


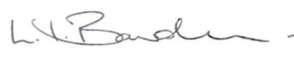

Desk Study

Manchester Airport Group

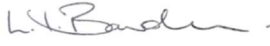
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Quality information

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EXECUTIVE SUMMARY

This Phase 1 Geo-environmental and Geotechnical Desk Study Report was commissioned by Manchester Airport Group for the proposed development of a combined bussing and motor transport service centre, public long stay car park, and amendments to road infrastructure, together with the provision of landscaping and surface water drainage infrastructure and the demolition of four residential properties.

The site is located west of the Manchester Airport Viewing Park, centred on National Grid Reference (NGR) 381000, 384220, with access from Wilmslow Old Road. The site is roughly rectangular in shape, is relatively flat and comprises undeveloped open land associated to the former Cloughbank Farm and the Manchester Airport RVP Events Field. The site has remained undeveloped agricultural land, while the surrounding land was developed in conjunction with Manchester Airport from the mid twentieth century.

The purpose of this report is to present an appraisal of relevant information, acquired from a range of sources, to advise on the suitability of the site for the proposed development. A wide range of information sources were reviewed including: Ordnance Survey mapping, British Geological Survey Geological Mapping and Borehole Database, Landmark Envirocheck, Environment Agency, Coal Authority data, Zetica UXO Pre-Desk Study Assessment and UK Radon database.

The site is underlain by superficial deposits of Glacial Till (Secondary (undifferentiated) Aquifer) of Quaternary age, and bedrock of the Bollin Mudstone Member (Secondary B Aquifer) of Triassic age. The site is not located within a floodplain and is at very low risk of flooding.

With regards to land contamination, an initial conceptual site model and preliminary risk assessment was formulated for the potential presence and mobilisation of contamination across the site. Several source-pathway-receptor linkages of low to moderate risk were identified. Those identified as moderate risk include: CoPC in leachate generated from Made Ground and previous land use leaching into surface waters (Cotteril Clough Brook / surface water pond), and migration of ground gases associated to the Made Ground into the proposed above ground structure.

Site specific geotechnical considerations across the site include ascertaining the extent and thickness of Superficial deposits (both natural and man-made). The potential for natural hazards is negligible to very low risk at the site.

A ground investigation is recommended to be performed at the site and is to comprise; an array of trial pits to 3.5m depth or to Bedrock and, a utilities survey (if not currently carried out) to ascertain the location and depth of buried services, along with associated geochemical analysis and geotechnical laboratory testing.

Table of Contents

1.	Introduction	1
1.1	Terms of Reference	1
1.2	Aims and Objective.....	1
1.3	Source of Information	1
2.	Site Location and Description	2
3.	Site Reconnaissance	2
4.	Site Setting	4
5.	Site History Information.....	5
6.	Environmental Setting.....	7
7.	Initial Conceptual Site Model (CSM)	8
7.1	Assessment Framework	8
7.2	Sources of Potential Contamination	8
7.3	Viable Pathways	9
7.4	Viable Receptors	9
7.5	Risk Assessment Principles.....	10
7.6	Preliminary Risk Evaluation	12
8.	Preliminary Risk Assessment.....	13
9.	Geotechnical considerations.....	18
10.	Conclusions and Recommendations	18

Figures

Appendix A - Landmark Envirocheck Report

Appendix B - Photo Log

1. Introduction

1.1 Terms of Reference

Project Number	60578226
Site Name	Cloughbank B
Client	Manchester Airport Group (MAG)
Appointment	MAG, commissioned AECOM to complete a summary geotechnical and geo-environmental desk study for the proposed development of a combined bussing and motor transport service centre, public long stay car park, and amendments to road infrastructure, together with the provision of landscaping and surface water drainage infrastructure and the demolition of four residential properties. This information will be used to develop a ground investigation to confirm the identified soil conditions and define the environmental risks.

1.2 Aims and Objective

Principal aims and objectives of the Phase 1 geo-environmental desk study

- Undertake a site reconnaissance to evaluate the site and adjacent land, including the current Cloughbank car park location;
- Evaluate the current ground conditions and stability of the surrounding land;
- Assess the likelihood of finding chemicals of potential concern (CoPC), their nature and extent;
- Evaluate the historical and current environmental site setting to identify possible sensitive receptors;
- Provide information on likely contaminant-pathway-receptor relationships to identify potential risk;
- Formulate an initial conceptual site model to enable the design of an effective field investigation (if required);
- Develop a preliminary risk assessment;
- Determine the recommendations for further site investigation, (if any);
- Identify special procedures (including access) and precautions (specifically safety, health and environmental risks) that may be necessary during subsequent site investigation.

1.3 Source of Information

Data Sources - The following data sources have been used in the compilation of this report:

1. Landmark Envirocheck Report (Reference: 167570890_1_1)
2. Landmark Envirocheck Report Historical Ordnance Survey Mapping (Reference: 167570890_1_1)
3. British Geological Survey - 1: 50,000 BGS Sheet 98 – Stockport Solid & Drift Geology Map

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4. British Geological Survey website (<http://www.bgs.ac.uk/>)

 5. BRE (2007) 'Radon: guidance on protective measures for new buildings'

 6. UK Radon website (<http://www.ukradon.org/>)

 7. Environment Agency website (<http://www.environment-agency.gov.uk/>)

 8. MAGIC website (<http://magic.defra.gov.uk/>)

 9. Coal Authority Website (<http://coal.decc.gov.uk/>)

 10. Zetica Unexploded Ordnance Risk Map (Online - http://www.zetica.com/uxb_downloads.htm)

 12. Google Maps (<https://www.google.co.uk/maps>)
-

2. Site Location and Description

Site Location	The site is located west of the Manchester Airport Viewing Park off Wilmslow Road and Wilmslow Old Road, centred on NGR 381000 E, 384220 N.
Site Description	The site is roughly rectangular in shape consisting of predominantly flat, undeveloped open agricultural land, occupying approximately 12Ha, and includes land associated to Cloughbank Farm and the Manchester Airport RVP Events Field.
Current surrounding land use (immediately adjacent to site)	North: The site is bound by Wilmslow Old Road and industrial / airport associated buildings. East: The site is partially bound by a tree line and the Manchester Airport Viewing Park, with Manchester Airport located further east. South: The site is bound by a tree line and stream, with undeveloped land further south of the site boundary. West: The site is bound by a tree line and stream, with the current Cloughbank car park located directly west of the site boundary.

3. Site Reconnaissance

Details of site walkover	A site walkover was performed by an AECOM Engineer on Monday 04 June 2018. The aim of the site walkover was to ascertain the general layout of the site, as well as identify any visible surface features that may affect the proposed development.
Findings of site walkover	Access to the site was made from Wilmslow Old Road. Access to the southern portion of the site and the RVP Events Field is made easier through the Manchester Airport Viewing Park, located to the east of the main site entrance. Access to the northern portion of the site should be made through the main site entrance, however heras fencing may need to be removed to allow ease of access for heavy vehicles

The site is partially covered in concrete and broken tarmac associated with previous road layout to the historical farm. It is uncertain as to the depth and extent of the Made Ground.

Several surface features of relevance were observed at the site. Multiple locations of suspected infilled ponds / depressions were noted sporadically across the site, with a differing vegetation to the immediately surrounding land. A stockpile of unidentified material to the north of the listed farm house, and numerous stockpiles of unidentified material south west of the listed farm house are currently present, with the later showing evidence of broken tarmac and construction waste. The source to the waste material is unknown.

Farm buildings surrounding the listed farm house show evidence of collapsed asbestos cement roofing, and accumulation of associated debris. Ad-hoc fly tipping was also present across the wider site.

No land drains were observed during the reconnaissance.

The reconnaissance confirmed the presence of a SSSI associated to the Cotteril Clough Brook and green belt, and endangered species pond to the east of the site and RVP Events Field.

4. Site Setting

Geology

Geological Strata

Made Ground: Concrete and broken tarmac.
 Natural Superficial Geology: Glacial Till, likely of granular grading (Devensian, of Quaternary Period).
 Solid Geology: Bollin Mudstone Member (Anisian, of Triassic Period), of the Lower Keuper Marl.
 Structural Features: None within site boundary or within 500m of the site.

Table 1. Summary of BGS Trial Pit Information in proximity of proposed site

Geological Unit	Min depth (m, bgl)	Max depth (m, bgl)	Max Estimated Thickness (m)
Made Ground: Fine to coarse gravel	0.0	0.4	0.4
Glaciofluvial Deposits: Slightly sandy clay with fine to coarse gravel	0.4	2.3	1.9
Bedrock: Friable clay (completely weathered marl)	1.5	3.4	Unproven

The following BGS Trial Pits were utilised to determine the likely geological sequence at the site: SJ88SW91, SJ88SW92, SJ88SW95, SJ88SW97, SJ88SW99 and SJ88SW100. There are no BGS accessible boreholes within the immediate surrounding area.

Radon

The site is not in a Radon Affected Area; less than 1% of properties are above the Action Level. No radon protective measures are necessary.

Hydrogeology

Underlying Geology Aquifer Classes

Natural Superficial Geology: Secondary (undifferentiated)

Solid Geology: Secondary (B) Aquifer, lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, permeable horizons and weathering.

Groundwater Vulnerability / Soil Classification

Not classified.

Groundwater Quality

No information available.

Groundwater Source Protection Zone Status

The site is not located within a groundwater Source Protection Zone. There are no groundwater Source Protection Zones located within 2km of the site boundary.

Hydrology

Surface Water Receptors

Cotteril Clough Brook bounds the site to the south and west. Numerous unnamed ponds are located sporadically within the off-site surrounding undeveloped land.

Surface Water Quality

Based on Environment Agency information, provided in the Landmark Envirocheck report; two records are available within 1km of the study site.

- Cotteril Clough Brook. Biological Quality Grade D (2004-2009), River Quality E; NGR: 380890, 384422. Present immediately south and west of the site boundary.
- Bollin River. River Quality D; NGR: 380175, 383688. 683m south west of the site boundary.

Flooding

The site is located adjacent to Cotteril Clough Brook, however defined as a flood zone 1. The risk of flooding from Rivers and the Sea (RoFRaS) on site is identified as very low as the chance of flooding in any given year is less than 1 in 1000.

The site is within an area susceptible to groundwater flooding of property below ground level and at the surface.

Water Abstractions

There are no recorded water abstraction points within 1km of the site boundary.

Unexploded Ordnance Risk

UXO

A review of Zetica's online unexploded ordnance risk maps indicates that the site is within a 'low' area for presence of sub-surface unexploded ordnance (UXO).

5. Site History Information

Date	Scale	On-site	Off-site (<250 m and any other significant; distances/orientations relate to the site unless stated)
1882	1:10,560	The site consists of undeveloped open ground associated with Cloughbank farm located on the central eastern boundary and anticipated for an agricultural land use. The site is subdivided into multiple fields and boundaries, with a road running through the northern section of the site. A footbridge is accessible from the stream located to the west. Ponds and surface water features are identified across the site.	The site is bound to the north by an unnamed road. The surrounding land consists of undeveloped fields, with sporadic buildings located throughout. St Marys All Saints Church is located approximately 200m north west from the site boundary. Higher Mainwood Farm is located approximately 250m south east.
1899	1:10,560	The road has been modified and terminates at Cloughbank Farm. It does not run through the northern section of the site.	Subtle development along the unnamed road to the north, with cottages and vicarages present.
1910 - 1911	1:10,560	No significant developments.	No significant developments.
1938	1:10,560	No significant developments.	Farming development towards the north has extended within 250m of the site boundary.
1954	1:10,000		

Date	Scale	On-site	Off-site (<250 m and any other significant; distances/orientations relate to the site unless stated)
		No significant developments.	Unnamed road is now named Wilmslow Road. Area of previously vacant land to the north east and east has been developed as part of Ringway Airport. Significant development of buildings and infrastructure to the north of the site boundary.
1971 - 1977	1:10,000	No significant developments.	Wilmslow Road has been renamed Wilmslow Old Road, due to the construction of a new Wilmslow road to the west of the site. Ringway Airport has been renamed Manchester Airport. Higher Mainwood Farm has been removed to allow for the extension of the runway at Manchester Airport. Developments to the north of the site have been labelled aircraft hangars and sewage works. Airport fire station has been built to the north of the site boundary.
1990 – 1991	1:10,000	No significant developments.	Further development of the land to the east of the site for airport associated activities.
1999	1:10,000	No significant developments.	Manchester Airport Viewing Park has been constructed to the east of the site, with area purposed built for car park. Airport fire station has been built to the north of the site boundary.
2006	1:10,000	No significant developments.	No significant developments.
2018	1:10,000	One additional building has been erected within Cloughbank Farm.	Increased development east of the site boundary labelled 'works' and inferred for sewage treatment. Construction of an airport mast to the south of the site.

6. Environmental Setting

Landfill Sites

Environment Agency landfill data indicates no records of landfill data within 1km of the site.

Based on information available in the Landmark Envirocheck report, three records of historic landfill are present within 1km of the site; 663m south, 812m south and 818m south. No details of waste type or landfill license holders are available, other than Manchester Airport Plc.

Pollution

Based on the information available in the Landmark Envirocheck report, there are no records of substantiated pollution within 1km of the site boundary.

There are six records of pollution incidents to controlled waters within 500m of the site boundary.

Table 2. Summary of pollution incidents to controlled waters

Location	Date	Pollutant	Severity
Cotteril Clough, 6m north	1992	Oils – Unknown	Category 3 – Minor Incident
Cotteril Clough, 9m north	1996	Chemical – De-icing Compounds	Category 2 – Significant Incident
Cotteril Clough, 55m north east	1995	Miscellaneous – Foam	Category 3 – Minor Incident
Cotteril Clough, 121 north east	1994	Miscellaneous – Inert Suspended Solids	Category 3 – Minor Incident
Cotteril Clough, 147m north east	1994	Miscellaneous – Other	Category 2 – Significant Incident
Tributary of Bollin, 262m north east	1995	Miscellaneous – Foam	Category 3 – Minor Incident

Other Observations including Sensitive Sites

Based on Environment Agency information, provided in the Landmark Envirocheck report, there are several sensitive land uses surrounding the proximity of the site within 1km.

- Ancient Woodland. Immediately west associated to Cotteril Clough, 579m north west associated to Sunbank Wood, 899m south east associated to Oversley Farm Wood.
- Areas of Adopted Green Belt. 5m south, 628m south east, 882m north west, 893m north west, 927m north west.
- Areas of Unadopted Green Belt. 603m south.
- Sites of Special Scientific Interest (SSSI). Immediately west associated to Cotteril Clough.

Anecdotal information provided by Manchester Airport identified an endangered species pond directly east of the site before the Manchester Airport Viewing Park, however was not identified through the Landmark Envirocheck report. The presence of this feature was confirmed during the site reconnaissance.

7. Initial Conceptual Site Model (CSM)

7.1 Assessment Framework

The site, in terms of potential land contamination, will be regulated by the Local Authority (Manchester City Council) under the Town and Country Planning Act 1990 (as amended), taking account of the National Planning Policy Framework 2012, with the Environment Agency, Natural England and English Heritage acting as statutory consultees.

The “suitable for use” approach is adopted for the assessment of contaminated land where remedial measures are only undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting.

Additional environmental liabilities can arise through provisions contained within statutory legislation including Part 2A of the EPA 1990, the Water Resources Act 1991, the Groundwater Regulations 2009 and the Water Act 2003.

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and CLR 11.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- **Source:** hazardous substance that has the potential to cause adverse impacts;
- **Pathway:** route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- **Receptor:** target that may be affected by contamination: examples include human occupants/users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

The following sections detail the initial conceptual site model (CSM) which has been developed for the site with a view to assessing the potential risks / liabilities and constraints associated with the site in its current condition. Risks associated with future construction works and the proposed redevelopment design has also been assessed. The potential sources of contamination, potential receptors and potential contaminant pathways are identified for the site.

7.2 Sources of Potential Contamination

The site is assumed to have varying thicknesses of made ground in the locations where buildings are present. A review of the historical mapping, alongside the Landmark Envirocheck report and DEFRA website did not outline any historical sources of contamination on site. During the site reconnaissance, a number of current potential sources for contamination were identified and summarised in Table 7.2-1, below:

Table 7.2-1: Summary of Potential Sources and Associated Contaminants of Potential Concern (CoPC)

Sources	Onsite:
	<ul style="list-style-type: none"> • Made Ground – Concrete, broken tarmac and infilled ponds. • Road access (historical); Oil / fuel hydrocarbons, fuel oxygenates including MTBE, free phase product (LNAPL), hydraulic fluid, asbestos and asbestos containing materials (ACMs), chlorinated hydrocarbons, PCBs, metals and semi-metals and inorganic and organic chemicals. • Agriculture; Fertilisers, pesticides, herbicides, inorganics, nutrients, phosphate, nitrate and metals. • Derelict farm buildings associated to the Cloughbank Farm complex; Asbestos and asbestos containing materials (ACMs), thermal asbestos and asbestos insulating board

(AIB), PCBs, metals and semi-metals and inorganic and organic chemicals, fertilisers, pesticides, herbicides, nutrients, phosphate and nitrate.

- Stockpiles of waste material from Manchester Airport construction and agricultural sources; miscellaneous contaminants.
- Ad hoc-fly tipping and associated miscellaneous contaminants.

Offsite:

- Made Ground - Asphalt, potentially infilled pond, metals and semi-metals, inorganics, PCBs, asbestos and ACMs, thermal asbestos and asbestos insulating board (AIB).
 - Airport land use; Oil / fuel hydrocarbons including aviation kerosene, aviation gasoline and diesel, propane, de-icing chemical agents, organic solvents, fire-fighting agents, washing agents, wheel cleaners, rust removers, corrosion inhibitors, asbestos and ACMs, thermal asbestos and AIBs, metals and semi-metals, inorganics and PCBs.
 - Garage; Oil / fuel hydrocarbons including petrol and diesel, fuel oxygenates including MTBE, free phase product including LNAPL and hydraulic fluid.
-

7.3 Viable Pathways

Potential pathways associated with the proposed development have been identified as follows:

Human Health

- Direct dermal contact including soil particulates associated with Made Ground and associated infill materials;
- Inhalation and ingestion of soil particulates derived from Made Ground and infill materials; and
- Inhalation of soil vapour derived from Made Ground and infill materials.

Controlled Waters

- Vertical migration of chemicals from impacted Made Ground and groundwater present in superficial deposits (Made Ground);
- Lateral migration of impacted shallow groundwater off-site towards Cotteril Clough Brook on the south and western boundaries;
- Lateral migration of impacted shallow groundwater to the Secondary (undifferentiated) Aquifer within the superficial geology and Secondary B Aquifer within Bollin Mudstone.
- Preferential migration of substances along routes of underground services, including site drainage, pipelines and associate trenches (including granular backfilling materials).

Buildings & Infrastructure

- Direct contact of buried concrete and potable water supply pipework with aggressive ground conditions (pH and sulphate);
- Ground gas – accumulation of site derived bulk ground gases (carbon dioxide and methane) in enclosed spaces and service/utility trenches.

7.4 Viable Receptors

Potential receptors associated with the potential development have been identified as follows:

Human Health

On-site - Current

- Site visitors and trespassers (acute exposure).
- Construction & maintenance workers (acute exposure).

On-site - Future

- Site visitors & trespassers (acute exposure).
- Construction & maintenance workers (acute exposure).
- Site workers (chronic exposure)

Off-site – Current

- Site visitors (acute exposure).
- Site workers (chronic exposure).

Off-site – Future

- Site visitors (acute exposure).
- Site workers (chronic exposure).

Controlled Waters

- Surface water features; Surface protected species pond on the eastern site boundary.
- Surface water – Cotteril Clough Brook on the south and western boundaries of the site.
- Secondary (undifferentiated) Aquifer within the superficial geology.
- Secondary B Aquifer within Bollin Mudstone

Ecology

- On-site and off-site flora and fauna

Buildings & Infrastructure

- Buried concrete services, channels and drains.
- Asphyxiation & explosion - accumulation of permanent ground gases (e.g. carbon dioxide and methane) in enclosed spaces and service / utility trenches / ducts and / or penetrations.

7.5 Risk Assessment Principles

Current good practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on Model Procedures for the Management of Land Contamination.

For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in EA, Chartered Institute of Environmental Health (CIEH) and National House Building Council (NHBC) R&D Publication 66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008), the magnitude of the risk associated with potential contamination at the site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity); and
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table 7.4-1, below:

Table 7.4-1: Summary of Severity of Risk

Severity	Definition of Examples
Severe	<ul style="list-style-type: none"> Acute risks to human health, likely to result in “significant harm” (e.g. very high concentrations of contaminants/ground gases) Catastrophic damage to buildings/property (e.g. by explosion, sites with high gassing potential, extensive VOC contamination) Major pollution of controlled waters (e.g. surface watercourses or Principal aquifers/source protection zones) Short term risk to a particular ecosystem
Medium	<ul style="list-style-type: none"> Chronic (long-term) risk to human health likely to result in “significant harm” (e.g. elevated concentration of contaminants/ground gases) Pollution of sensitive controlled waters (e.g. surface watercourses or Principal/ Secondary aquifers) Significant effects on sensitive ecosystems or species
Mild	<ul style="list-style-type: none"> Pollution of non-sensitive waters (e.g. smaller surface watercourses or non-aquifers) Significant damage to crops, buildings, structures or services (e.g. by explosion, sites with medium gassing potential, elevated concentrations of contaminants)
Minor	<ul style="list-style-type: none"> Non-permanent human health effects (requirement for protective equipment during site works to mitigate health effects) Damage to non-sensitive ecosystems or species Minor (easily repairable) damage to buildings, structures or services (e.g. by explosion, sites with low gassing potential)

The probability of the risk occurring is classified according to the criteria in Table 7.4-2, below:

Table 7.4-2: Likelihood of Risk Occurrence

Likelihood	Explanation
High	Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term
Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 7.4-3, below:

Table 7.4-3: Risk based on comparison of likelihood and severity

		Severity			
		HIGH	MEDIUM	MILD	MINOR
Likelihood	HIGH	Very High	High	Moderate	Moderate/Low
	LIKELY	High	Moderate	Moderate/Low	Low
	LOW	Moderate	Moderate/Low	Low	Very Low
	UNLIKELY	Moderate/Low	Low	Very Low	Very Low

7.6 Preliminary Risk Evaluation

A preliminary assessment of the potential risks associated with the identified potential sources of contamination at the site to the various potential receptors is discussed and presented in the following section (Refer to Table 7.6-1).

The level of risk is determined based on the current condition of the site (i.e. the effects of mitigation measures are not included, neither is the potential impact of the proposed future development of the compound and new pipework).

The preliminary risk assessment undertaken with in this section does not consider acute linkages for construction and maintenance workers. AECOM anticipates that these acute linkages will be managed by appropriate health and safety measures. Further details relating to this are discussed in the Section 7.7.

8. Preliminary Risk Assessment

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Level of Risk	Discussion
CoPC within the Made Ground associated with previous and current land uses	Direct dermal contact	<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Medium	Low	Moderate / Low	1. The site is currently predominantly undeveloped land associated to the historical Cloughbank Farm, with Made Ground consisting of concrete and broken tarmac, stockpiles of waste material and derelict farm buildings. The Made Ground is partially present across the immediate surroundings of the farm buildings.
		<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Medium	Unlikely	Low	2. Following construction of the car park, future areas of exposed ground are likely to be limited, with soft landscaping areas to be minimal. The proposed motor transport, bussing and car park development is likely to be predominantly covered in compacted gravel and asphalt, limiting the pathway for dermal contact.
	Inhalation and ingestion of particulate	<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Medium	Low	Moderate / Low	3. Hardstanding is present around the Cloughbank Farm buildings, however appears to be in a good state of repair. Dense vegetation across the site is likely to mitigate direct exposure of residual soils.
		<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Medium	Unlikely	Low	4. As per item 2. above.
		<u>Off-site receptors:</u> Human health: Including staff and visitors to Manchester Airport Viewing Park during construction works (acute).	Medium	Low	Moderate / Low	5. Demolition of the modern farm barns and Made Ground, and the residential properties, may potentially mobilise contaminants off-site. However, appropriate dust suppression methods will be used during this phase of works to limit the likelihood of mobilisation.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Level of Risk	Discussion
		<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Medium	Low	Moderate / Low	6. The level of risk with regards to site wide vapours and volatiles within the Made Ground is considered low based on historic land use at the site.
	Inhalation of soil vapours	<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Medium	Low	Moderate / Low	7. The risk of vapour inhalation is unlikely where the development comprises an open surface car park. The proposed development also incorporates a motor transport and bussing facility with an enclosed structure, however the likelihood of a build-up of gases is considered low.
		<u>Off-site receptors:</u> Human health: Site workers and visitors at Manchester Airport Viewing Park (acute).	Medium	Low	Moderate / Low	8. Once vapours have been mobilised, there is the potential for them to move off-site. The surrounding land consists predominantly of open ground, limiting the potential for vapours to build up in enclosed spaces. Appropriate dust suppression methods are to be used during demolition of Made Ground.
	Plant uptake	<u>On-site receptors:</u> Flora and fauna: Areas of vegetation / established tree line on the site boundary.	Mild	Low	Low Risk	9. No evidence of stress was apparent on any vegetation during the site reconnaissance suggesting levels of CoPC on site and within the surrounding area are not affecting current established vegetative growth.
	Direct contact	<u>Development infrastructure:</u> Buried structures including concrete foundations, services and potable or industrial water supply.	Mild	Low	Low Risk	10. Development infrastructure is likely to be limited to shallow foundations, and therefore not certain to be in direct contact with any CoPC. The appropriate specification of materials should be used for supply pipes, buried services and gas / damp protective membranes. Concrete foundations should be designed appropriate to the environmental weathering conditions.
CoPC in leachate generated from Made Ground / and shallow /	Lateral migration of CoPC within shallow groundwater	<u>On-site receptors:</u> Surface water: Cotteril Clough Brook surrounding the south and west of the site boundary. Surface protected species pond on the eastern site boundary.	Medium	Likely	Moderate	11. It is likely that the Made Ground would facilitate lateral surface run off, however dense vegetation may mitigate the direct exposure to residual soils. It is uncertain the depth or extent of Made Ground. Cotteril Clough Brook and protected species pond located on the periphery of the site.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Level of Risk	Discussion
perched groundwater	Vertical migration of CoPC in groundwater	<u>On-site receptors:</u> Groundwater: Secondary (undifferentiated) Aquifer within the superficial geology. Groundwater: Secondary B Aquifer within the Bollin Mudstone.	Medium	Low	Moderate / Low	12. The superficial geology consists of glaciofluvial sand and clay deposits. Given that the site is located within a Secondary (Undifferentiated) Aquifer, groundwater availability as a resource may be limited to the local area. Depth to groundwater is unknown.
		<u>On-site receptors:</u> Flora and fauna: Areas of vegetation / established tree line on the site boundary.	Mild	Low	Low	13. As per item 9. above.
	Plant uptake	<u>Off-site receptors:</u> Flora and fauna: Areas of vegetation, shrubs and trees off site.	Mild	Low	Low	
		<u>Development infrastructure:</u> Buried structures including concrete foundations, services and potable or industrial water supply.	Mild	Low	Low	14. As per item 10. above.
Direct contact	Inhalation of particulate	<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Severe	Unlikely	Moderate / Low	15. There is the potential for asbestos to be present in any Made Ground present on site, particularly associated with the demolition of former buildings in both the new compound area and along a partial area of the new pipework route.
		<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Severe	Unlikely	Moderate / Low	16. During the construction phase it is likely that the Made Ground (if present) across the site will be exposed. Exposure to potential ACMs can be further reduced through management of the appropriate H&S protocols and practices. Any Made Ground found to be contaminated with asbestos should be removed / capped prior to any potential development.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Level of Risk	Discussion
Ground gases associated with the Made Ground	Migration into enclosed spaces - Inhalation	<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Medium	Unlikely	Low	17. Made Ground in the local area may cause a potential risk from bulk ground gas generation. The site is currently open ground with minimal areas of enclosed space. Ground gases are likely to disperse into the atmosphere, if released. If contractors / maintenance workers are required to break ground, ground gas monitoring and appropriate mitigation measures should be put in place.
		<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Medium	Likely	Moderate	18. There is the potential for an accumulation of ground gas to build up in the future above ground structure proposed for the site infrastructure associated to Made Ground and previous land use. Ground investigation should be undertaken to confirm the ground gas conditions beneath the site and mitigation measures can be designed, if required. Any below ground excavation should be undertaken following appropriate H&S procedures, with monitoring in place as required.
	Migration into enclosed spaces – explosion	<u>Off-site receptors:</u> Human health: Including site workers and visitors to Manchester Airport Viewing Park (acute).	Medium	Low	Moderate / Low	19. There is the potential for any ground gas to migrate off site through granular Made Ground or shallow superficial deposits, however it is anticipated that there are limited enclosed spaces across the wider area for ground gas to accumulate.
		<u>On-site receptors – Current:</u> Human health: Site visitors and trespassers (acute).	Medium	Unlikely	Low	20. No enclosed spaces currently above ground level in the location of the proposed development. If contractors / maintenance workers are required to break ground, ground gas monitoring and appropriate mitigation measures such as confined spaces procedures should be put in place.
		<u>On-site receptors – Future:</u> Human health: Future site visitors (acute). Human health: Site workers (chronic exposure).	Medium	Likely	Moderate	21. As per item 18. above.

Land to the South of Wilmslow Old Road

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Level of Risk	Discussion
		<u>Off-site receptors:</u> Human health: Including site workers and visitors to Manchester Airport Viewing Park (acute).	Medium	Low	Moderate / Low	22. As per item 19. above.

9. Geotechnical considerations

Mining	Based on Information from the Landmark Envirocheck report, there are no records of coal and non-coal mining within 50m of the study site. The site lies within the area defined as the Cheshire Brine Compensation District.
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The Landmark Envirocheck report indicates the scheme is classified as follows with respect to potential natural hazards:

- Collapsible ground stability – Very low; slope instability is unlikely to be present.
- Compressible ground – Negligible; Deposits with potential to collapse when loaded and saturated are unlikely to be present.
- Soluble rocks – Negligible; soluble rocks may be present, but unlikely to cause problems except under exceptional circumstances.
- Running sand – Very low; very low potential for running sand only increased if water table rises or strata are exposed to water.
- Shrink swell – Very low; ground conditions are predominantly low in plasticity.

Based on the foregoing desk study the following considerations have been identified that should be investigated as part of a ground investigation:

- The extent, thickness and composition of Made Ground, and glacial till.
- Dense vegetation is present across the entire site, with tree coverage lining the site boundary. This vegetation will need to be removed before any works can start.
- The site reconnaissance highlighted numerous infilled ponds with unidentified material. Made Ground is unlikely to provide a suitable founding stratum due to the variability of materials. This Made Ground may require excavation and replacement with engineered fill or ground improvement.
- Previously infilled ponds and standing water off-site, observed during the site reconnaissance, indicate the presence of a potentially high groundwater level. This should be considered for the stability of excavations required for intrusive investigations. The permeability of underlying superficial geology may be required to interpret the drainage design beneath the site.
- The presence of the Bollin Mudstone may lead to increased sulphate levels beneath the site, and therefore the potential for chemical attack on buried structures. Tests should be undertaken as part of a ground investigation to determine the aggressiveness of the ground to concrete, although deep foundations may not be required.

10. Conclusions and Recommendations

Conclusions	MAG commissioned AECOM to complete a geotechnical and geo-environmental desk study report for the proposed development of a combined bussing and motor transport service centre, public long stay car park, and amendments to road infrastructure, together with the provision of landscaping and surface water drainage infrastructure and the demolition of four residential properties. This information will be used to develop a ground investigation to confirm the identified soil conditions and define the environmental risks onsite. The desk study identified: <ul style="list-style-type: none">• Site description: Current undeveloped open ground associated to Cloughbank Farm, with farming buildings located at the centre of the site. NGR 381000, 384220. 12.17Ha.• Geology: Natural Superficial Geology - Glacial Till, likely of granular grading (Devensian); Solid Geology - Bollin Mudstone Member (Anisian).• Aquifers: Superficial Geology – Secondary (undifferentiated); Solid Geology – Secondary B.
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- Historical mapping identified that the site has remained for agricultural use and within the current architecture since c. 1882.
 - Low level of risk to future site workers associated to direct dermal contact and inhalation / ingestion of particulate if appropriate protective equipment is implemented.
 - Low to moderate level of risk to current on-site visitors and workers, and off-site receptors associated to the current conditions for direct dermal contact, inhalation / ingestion of particulate and inhalation of site wide vapours. There is also a low to moderate risk associated to vertical migration of CoPC into the deeper groundwater.
 - Moderate level of risk to on-site surface water receptors associated to lateral migration of CoPC within potential shallow groundwater. There is also a moderate level of risk to any proposed above ground structures associated to the migration of ground gases into any future enclosed space.
 - Unknown ground conditions due to the lack of intrusive investigations across the site. There is no current information on the thickness, composition and extent of the underlying geology, or the presence / depth to groundwater.
 - The existence of current buildings on site could lead to the presence of buried foundations and services.
 - Although unlikely for the need for deep foundations, there is the potential for chemical attack on buried concrete due to the Bollin Mudstone potentially increasing the sulphate levels beneath the site.

Recommendations

Based on the above conclusions we recommend that a ground investigation is carried out. Proposed intrusive works for the ground investigation include, but are not limited to:

- A building asbestos survey to be carried out by a suitably qualified and experienced contractor on the farm buildings surrounding the listed farm house;
- Site service clearance if no utility survey has been carried out, and;
- 3 day of trial pit excavation for in situ CBR testing and hand shear vanes, and;
- 5 window sample boreholes with monitoring wells installed.
- In situ sampling of stockpiles surrounding the agricultural farm house, and;
- Collection of disturbed composite soil samples to aid with the potential waste classification of any potentially off-site disposal of waste materials, and;
- Ecology survey due to the need for removal of vegetation across the site, and to establish if any invasive plant species and protected species are present at the site.

After completion of intrusive works, the geo-environmental condition of the Made Ground and underlying Superficial deposits will be assessed through chemical analysis for key determinants. Geotechnical laboratory testing will be undertaken to aid in design.

A ground investigation technical note will be produced for geo-environmental and geotechnical risk identification and interpretation.

Observations

AECOM is advised that:

- No deep boreholes are required to assess the potential for ground water to be impacted by CoPC.
 - No ground gas risk assessment is required.
 - No assessment is required of material stockpiles. It would be useful to know the origin of the stockpiles and to see copies of the exemptions / permits under which these waste deposits have been allowed to be deposited at the site by the Regulators. If not, such documentation is in
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place then stockpiles may be considered uncontrolled wastes and be in contravention of the Waste Framework Directive. If the stockpiled materials or any other site one materials are to be used within this scheme or to be moved to other locations this **must** be done under appropriate controls.

- AECOM would be pleased to discuss waste management controls and procedures with MAG.
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