

Task Report

TRINITY ESTATE, NORTH ORMESBY

Date: 23rd June 2003

Task:

4.5.6 Desktop ground investigation report
4.5.7 Toxic land report

Aim:

To identify environmental considerations and provide information relating to possible contamination within the site and provide preliminary information of ground conditions.

Methodology:

A local environmental/geotechnical investigation company, Hymas GeoEnviromental Ltd were engaged to carry out a preliminary desktop investigation into ground conditions and possible contamination. Considering the site's history, previous investigations, environmental information and regulatory enquiries.

Informal discussions have also been held with Middlesbrough Council's Contaminated Land Officer. (Dan O'Brian)

OVERVIEW SUMMARY

Site

The approximate site centre is located at Ordnance Survey Co-ordinates 451002E 519949N. The site consists mainly of housing estates, some of which are partially demolished or derelict, other associated buildings and warehouses to the east.

Previous use

The site has been predominantly developed for residential land use including adjacent school, youth centre, and church. Some heavy industry is or has been located locally to the north of the site comprising, gas works, chemical works, foundries and rail land. In the north eastern part of the site a clay pit has been backfilled and a timber yard constructed. Subsequent development of warehouses has taken place along the eastern part of the site.

Planning Conditions and Anecdotal Evidence

Previous planning applications within the area included, construction of warehouses of light industry, construction of Middlesbrough by pass and an interchange with a new entrance to the Market Place.

Anecdotal Evidence indicates Lawson Industrial Estate at the south east border of the site was previously clay pits that have been backfilled with waste materials including chemical wastes.

Geology

According to available geological maps the site is underlain by laminated clay with drift deposits with sporadic areas of low permeability drift deposits including estuarine/ marine alluvium. Solid geology is Triassic Mercia Mudstone rocks. No faults are present. The area is within the limit of Boulby Halite. The underlying geology is classed as a minor aquifer or non aquifer, with high leaching potential and may be vulnerable to contamination. However, presence of clay will afford some degree of protection and attenuation. The site is set within a tidal flood plain with a 0.5% chance of flooding each year.

Further inquiries should be made to the local authority and Environment Agency to establish any implications of flood potential.

Geology (continued)

The site is not located within a mining area therefore no mining report has been provided.

Previous Investigation

A previous site investigation was carried out by Hymas in 2002 on land adjacent to Holy Trinity Church. The investigation comprised six trial pits and indicated a thin veneer of Made Ground comprising subsoil/ soil, with ash in the north, and rubble, ash, coke, coal and clinker to the south. Made ground was deepest to the south; close to the church. Underlying the Made ground was a silty and/or sandy clay varying from firm to very stiff.

Other investigations undertaken in the area have indicated similar ground conditions to the one encountered at St Trinity Church with firm laminated clays encountered and with the addition of Made ground, notably within the Industrial areas with some hydrocarbons locally recorded within the Made Ground. The firm clays are generally suitable for a bearing pressure in the order of 125kN/m² for typical strip and trench fill foundations. Piling is required within areas of deeper made ground or else a pad foundation has been adopted where uniform Made Ground conditions have been encountered such as deep deposits of granular fill.

Sitecheck Summary

An assessment of local environmental issues was undertaken by Sitecheck. This information replaces much of the data traditionally produced by the Environment Agency.

In summary the information gathered from Sitecheck indicated the following;

- There are 14 former landfill sites within 1Km of the site centre (none within 250m),
- There are 53 discharge consents within 1Km of the site centre relating to industries such as: sewage disposal works
- There are 105 industrial sites licensed to store hazardous, radioactive or explosive substances. Also 105 chemical release sites within 500m of the site centre.
- An Notification of Installation of Handling Hazardous Substances (NIHHS) site is located 250-500m from the site centre.
- One scrap yard is present between 250-500m of the site centre.
- One waste treatment site is present within 500m of the site centre.
- Less than 1% of homes are likely to be above the action level for Radon. Only basic radon protection measures are required

Contamination Summary

The following land uses have been identified:

On Site: Residential land use, Low level Industry, Timber yard, Rail land.

Off site: Heavy industry, Railways, Residential areas, Backfilled clay pits, Gas works.

Associated Contamination

Gas works: Contamination due to spills, waste disposal, buried tanks or wells.

Wastes: Include ash and clinker, wastes in buried tanks/ pipes on/ in the ground.

Hazards: Toxic metals in ash or clinker; tank sludge. Alkalis and acids and gas.

Iron and Steel Industry: Contamination due to spillages and accidents.

Wastes: Sludge in drums and tanks, acid sludge. Most wastes have a mobile nature.

Hazards: Toxic heavy metals. Toxic sludge, also, acids and alkalis. Gasses, flammable materials and asbestos. Metal contaminants have limited mobility within the slag and ashes.

Chemical Plant:

Waste: Types include solid, liquid and gasses,

Hazards: Could be toxic, combustible, corrosive, gas, asbestos.

Oil Refinery

Waste: Typically sludge, oil wastes and liquids from tank bottoms.

Hazards: Include inorganic compounds such as ammonia and sulphur compounds, and heavy metals.

Railway Land

Wastes: From spillage, stockpiling, discharges and accidents.

Hazards: Clinker and ash may be contaminated with toxic metals. Lead paint and asbestos. PCB and oils frequently present.

Other: In addition; contamination from material used for infilling such as slags, shales, demolition rubble may be present. Also, some localised contamination associated with underground tanks from industry and fuel stations. **Small scale industries;** previous chimneys will produce deposits of ash and smoke leading to increase in contamination levels in soils. Contaminants and landfill gas present in backfilled clay pits. Anecdotal evidence indicates a small substation within the central part of Area 1 which can give rise to hydrocarbons and PCB's.

Risk Assessment

With due regard to the environmental setting of the site and current legislation in force, Hymas give the following assessments of perceived risk at each section of the site. Based on the above, 1) contamination sources, 2) migration potential and pathway and 3) target receptors have been assessed for each section:-

AREA 1 (NORTH WEST-NORTH)

Source – pathway – receptor assessment

Source

There is some potential for contamination in the section area, associated with imported fill materials, demolition rubble which may contain elevated metals, inorganics and traces of asbestos. Construction of the A66 by-pass would produce associated wastes, which may have the potential to migrate. The small substation also has potential for localised contamination from hydrocarbons and PCB's.

Migration of contaminants from the northern industrial area to the site is a risk

Pathway

The site is covered by car parks and roads across the main area of the site providing barrier to most contamination in the ground. The Made Ground is likely to contain some porous materials which can act as a pathway for leachable materials, water and soil gas, such as methane and carbon dioxide.

Redevelopment of the site will require sufficient investigation required to meet current guidance. The edges of the chemical works and gas works site are not in immediate contact of with the edge of site. Migration, however, from these sites to the study area cannot be discounted.

Target

The site is partially derelict but the remaining areas include housing estates have a higher risk than industrialised areas which are predominantly covered in hardstanding. Some previous reclamation may have taken place prior to or during the demolition process which may have removed potential sources of contamination such as asbestos etc.

AREA 2 (NORTH EAST-SOUTH EAST CORNER)

Source – pathway – receptor assessment

Source

There are some areas of potential contamination in the section area, mainly associated with the backfilled clay pit with unknown wastes. Additional spillages from lorry park, migrating chemicals from adjacent Lawson Industrial Estate and Timber Yard. Also possible migration of contaminants from the northern industrial area to the site.

Pathway

The site is covered by Buildings and tarmac/concrete across the main area of the site which provides a barrier. Redevelopment of the site will produce the need to undertake any necessary investigative work required to meet current guidance. The backfilled pit will be under a red classification.

Target

The site could pose possible contamination threat to construction workers during redevelopment of the site, and future owners of the redeveloped area.

Possibility of gas migration to residents and workers.

AREA 3 (SOUTH)

Source – pathway – receptor assessment

Source

The predominant source of contamination is likely to be associated with demolition rubble, imported materials and localised contamination. Migration of contaminants from the northern industrial area to the site, possible but remote. The site houses no industrial constructions and is mainly composed of a residential area with amenities.

Pathway

The site is covered by houses/buildings and car parks across the main area of the site providing some degree of protection to any possible contamination in the ground. Several playing fields attached to the school are present but are situated in an area with apparent low risk.

Redevelopment of the site will produce the need to undertake any standard environmental site investigation

Target

The site includes housing estates and amenities which would have a low probability of significant contamination due to little previous industrial development and the assumption that appropriate protective measures were taken when development of these areas took place ie, placement of topsoils and subsoils. However, some background contamination is likely and there is a possibility of migration of contaminated groundwater associated with localised areas flowing towards the drainage system and ultimately the River Tees.

CONCLUSION AND RECOMMENDATIONS

The Hymas assessment has identified some potential sources of contamination. However, given the past historical use, the majority of the site is likely to have a low contamination profile, with contamination likely to be demolition rubble and imported materials. However possible significant areas of contamination within areas of backfilled clay pit, rail land and timber yard will increase the risk rating within the region (north of Area 2). Middlesbrough Council's Contaminated Land Officer indicated that hydrocarbons in the form of diesel is a common contaminant within the ground in the area.

There is much heavy industry to the north of the site and background levels of contaminants in soils are likely to be raised in view of deposition of ash and smoke particles during the lifetime of the surrounding industries.

The possibility of migration of contamination in the groundwater from the north to the south and east and west cannot be discounted. Although the general groundwater flow will be towards the River Tees, the earthmoving operations, underground services etc will have altered the shallow groundwater pathway.

The surrounding area is heavily industrialised to the north of the site with several heavy industry types including sewage works, iron foundries, gas works and chemical works are or have been present. Several of these industries could be a possible source of contamination (contamination types have been summarised previously), especially if groundwater is travelling away from the River Tees towards the site.

Localised areas of surface contamination were observed during the walkover; such as diesel staining, concrete spillage and some domestic refuse; observed in the north east corner of the site.

Area 1 North West – North

It is considered that there is a 'low to moderate' risk of contamination of the site, although made ground and construction rubble can be expected across the area. Standard environmental site investigation work is suggested for this area with a provision to check for migration of contaminants from the north to the south from heavy industry such as gas works, chemical works and foundries. In addition exploration would be prudent within the area of the small substation.

CONCLUSION AND RECOMMENDATIONS (Continued)

Area 2 North East – South East Corner

The north east corner of the site (Area 2) has housed previous industry such as a timber yard with crane and engine shed etc which could produce a possible source of contamination; including ash and clinker from construction and any spillages or accidents on the site. A backfilled clay pit was previously present within the area of the Timber Yard. The east end of the site housing the warehouses could be a possible source although they were supposedly only used for light industry, but there is an elevated diesel tank on the site along with whatever is present inside the compound. The investigation within this area will require a closer grid of centres for exploration holes with boreholes targeting areas of the backfilled clay pit, the timber yard and rail land. Areas of tanks and spillages will require investigation. In addition monitoring pipework should be installed along the eastern and northern boundary to check for migration of gases and leachate.

Area 3 South

The remaining area of the site does not consist of any industrial activity either present or previous, therefore, made ground can be expected but possible contamination could be considered to be 'low' risk. This assumes that the area was not subject to migration of contaminants and/or imported fill. Standard environmental site investigation work is suggested for this area.

Overview

Based on this information it is in the opinion of Hymas GeoEnvironmental Ltd that the site represents a **low to moderate** risk with respect to environmental considerations. However some areas will require a more extensive investigation in view of the localised higher risk rating attached to them. This includes the land previously occupied by the rail network, the backfilled clay pits and the industrialised areas to the east.

CONCLUSION AND RECOMMENDATIONS **(Continued)**

The information gathered for the geotechnical properties of the site indicate a thin veneer of Made Ground is likely to be encountered over much of the site associated with building rubble and foundations and services with deeper localised areas around areas such as basements and the area to the north where the backfilled clay pit was encountered or else where importation of granular fill such as slag has taken place. The Made Ground is likely to be underlain by a firm/ firm to stiff laminated clay with a typical bearing capacity of 125kN/m² for normal shallow foundations placed within natural deposits. Deeper areas of Made Ground are likely to require either piled foundations, raft foundations or ground improvement depending upon the type and depth of Made Ground encountered. The plasticity of the natural clay is typically medium to high.

All investigation field work should include soil gas monitoring, water monitoring and chemical testing in order that the site can be characterised.

Scope of Work

It is considered that the spacing of exploration holes should be no greater than 50m and ideally a 30m grid pattern would be appropriate spacing for a site based with a low to moderate risk. The information gathered will provide information on contamination and geotechnical parameters for use in redevelopment of the site.

The locations will be limited by buildings, roads and underground services. It is considered that boreholes would be ideally suited for much of the site occupied by housing as the rig will cause minimum disturbance and allow for casing through granular soils and subsequently pipe installations. Elsewhere where there has been demolition then the use of boreholes and trial pitting would be appropriate with a closer grid of centres typically 20m within the area of the backfilled clay pit. The trial pits would allow much closer inspections of ground conditions at shallow depth and also are a much cheaper option than boreholes.

Monitoring pipework will be required throughout the site with some allowance for extra pipe installations along the northern and eastern boundary and within the backfilled clay pit.

The chemical testing should be based on the Interdepartmental Committee for the Redevelopment of Contaminated (ICRCL) suite plus asbestos screening with extra scope for other chemicals associated with industries in close proximity to the site. In addition to soils analysis, leachate and water testing will be required with monitoring of the water levels in the pipework in order that the groundwater flow can be determined.

CONCLUSION AND RECOMMENDATIONS **(Continued)**

Gas monitoring will be required and an allowance for gas sampling and laboratory analysis will be required.

Both the trial pits and boreholes can be utilised for the geotechnical assessment of the site and samples should be submitted to a geotechnical laboratory in order to aid foundation design.

We refer you to the Hymas GeoEnvironmental Ltd Phase 1 Desk Study Report No 30421 (May 2003) which is appended in supplementary documentation

Other Sources of Information

- A Geotechnical Interpretative Report in respect of the adjacent A66 Interchange was commissioned by Middlesbrough Borough Council. Report Ref: 00FLG/GI/INT.FINAL. May 27th 2003 – Scott Wilson.
- English Partnerships archive records relating to the piling work undertaken by the Teesside Development Corporation on land to the North of Middlesbrough Warehousing Company.

Future Actions

- Commission Ground Investigation and Contamination Investigation Reports as summarised above
- Obtain and review English Partnerships archive records relating to piling work undertaken by the TDC.
- Formulate options and negotiation strategy for addressing contamination issues when dealing with Middlesbrough Warehouse Company.