

Geotechnical and Environmental Audit Phase 2

**at: Former Tenaplas Plastics Factory
Tenaplas Drive
Upper Basildon
Berkshire**

For: Clancy Developments Ltd

Geotechnical and Environmental Audit Phase 2

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APPENDICES

Appendix 1 Geo-Environmental Services Ltd Report

1.0. EXECUTIVE SUMMARY

1.1 Description

- 1.1.1 The site is to be developed for residential purposes and will be occupied by twentyfive dwellings either detached or semi-detached. Twentythree of the dwellings will be constructed around the perimeter of a rectangular site with a large open area within the square of houses. A further two detached dwellings will be constructed on an adjacent separate plot.
- 1.1.2 A Phase 1 Environmental Audit was carried out by LBH Wembley in November 1997 and this identified the presence of some contamination on the site. The contamination resulted in the Environment Agency expressing concern about the risk of contamination to the aquifer. The concern was further expressed in the imposition of a planning condition requiring further investigation and details of appropriate measures to prevent pollution of the groundwater .
- 1.1.3 A full Geotechnical and Environmental Audit Phase 2 was conducted in the Autumn of 1998 and the report published in February 1999. The report has identified low levels of contamination in fill material from approximately mid way across the site to the western and southern boundaries. Some deep filled zones relating to previous clay excavations for brick making and the presence of a void at between 10 metres and 12 metres below ground level near the south east corner of the site were revealed. The latter is probably related to a chalk mine associated with brick manufacturer.
- 1.1.4 The findings have been reported to The Environment Agency indicating a very low risk to the aquifer. The matter is currently the subject of correspondence which is likely to result in a meeting between Officers of The Environment Agency, the Soils Engineer and Chemist to confirm the use of appropriate foundations to prevent contamination of the aquifer.
- 1.1.5 In order to provide an appropriate finished level for the housing development a cut and fill exercise will be carried out. The areas of low contamination occurring in the rear gardens or public open spaces will be capped by inert material before a suitable vegetable soil is placed in areas to be cultivated.
- 1.1.6 The results of the testing for flammable and asphyxiating gases reveals slightly elevated concentrations of carbon dioxide unlikely to cause any significant hazard.
- 1.1.7 Further investigation of the possible voids in the south east corner of the site are to be carried out using non-intrusive methods such as “ground conductivity” and “microgravity”.

1.2 Conclusions

- 1.2.1 Although the site has a long history of industrial use ranging from brickworks to more recently manufacture of plastic extrusions the levels of contamination on the site are only just above trigger levels and in the main part below action levels.
- 1.2.2 The proposed development of the site to accommodate domestic dwellings brings it into the category of high sensitivity. However the level of contamination simply requires the removal of the upper 400mm of contaminated soil from areas of proposed domestic garden and replacement with clean certified fill material. The above remedial works will be achieved during the cut and fill exercise which will take clean materials from the upper part of the site to overlay the low level contamination in the lower western and southern parts of the site.
- 1.2.3 Precautions against accumulation of carbon dioxide can take the form of additional air bricks below ground floor slab level in the domestic dwellings to ensure adequate cross ventilation of the void.
- 1.2.4 The ground conditions on the site dictate the use of a piled foundation system for all properties. A pile system that ensures direct contact and bonding of concrete with the surrounding ground materials will be most appropriate to ensure prevention of migration of any contaminants from the upper zones into the underlying aquifer. The appropriate foundation solution would therefore be either bored piles using insitu reinforced concrete or CFA piles using pressure pumped concrete.

2.0. **OBJECTIVE AND SCOPE**

2.1 **Introduction**

We were instructed in October 1998 by Clancy Developments Ltd of Clare House, Coppermill Lane, Harefield, Middlesex, UB9 6HZ to carry out a geo-technical and contamination assessment to form a Phase 2 Environmental Audit of the Former Tenaplas Plastics Factory site at Tenaplas Drive, Upper Basildon, Berkshire. The site was at the time occupied by Tenaplas Plastics for the production of plastic extrusions. The instruction followed the receipt of a site investigation report by LBH Wembley ref. LBH1478 November 1997 that has been executed for the vendors of the site. See Appendix 1E.

- 2.1.1 John Newton & Partners instructed Geo-Environmental Services Ltd carry out a detailed Geo-technical and Environmental Investigation (see Appendix 1) to assess the ground conditions existing on the site and to assist in developing foundation design for new buildings and a scheme of remediation for any contaminants encountered on the site.

2.2 **Site History Summary**

The site has been used for the manufacturer of bricks and tiles since the mid 19th Century and is recorded on 1877 Ordnance Survey Maps. Excavations and the construction of brick kilns continued into the early part of the 20th Century until the site was re-developed in 1939. Meldrum Tenaplas Extrusions Ltd took over and developed the site to its current level with a group of major buildings towards the centre of the site and the remainder covered with concrete accessways and minor buildings.

2.3 **The Geo-technical and Environmental Investigation Phase 1**

The site investigation report carried out by LBH Wembley was limited in scope but identified the presence of filled ground depths varying between 0.6 metres and 4.7 metres, contamination of fill materials and the presence of Reading Beds, natural deposits overlying the middle chalk formation.

- 2.4. The report established that the site was underlain by a minor aquifer as defined by the Environment Agency. On 5th December 1997 the Environment Agency responded to enquiries by Mr E J Payne of Edward J Payne & Associates, Architects for the project, (see Appendix 1). The Environment agency expressed concern about the risk of contamination of the aquifer and suggested a list of further investigation work to establish the true condition of the site.

2.5. **The Geo-technical and Environmental Investigation Phase 2**

Following the findings of the Phase 1 report a full Geo-technical and Environmental Investigation was commissioned and is commented upon below.

3.0. REVIEW OF REPORT BY GEO-ENVIRONMENTAL SERVICES LTD

3.1. The Report

- 3.1.1 The report is attached as Appendix 1 of this Phase 2 audit.
- 3.1.2 The report identifies slightly elevated PAH and Total Cadmium with Total Copper all at less than action levels.
- 3.1.3 The report comprehensively addresses concerns raised by the Environment Agency and demonstrates there is no serious risk to the aquifer. However the Environment Agency has not yet given written acknowledgement of this fact.

3.2.0. Resume of Findings

- 3.2.1 The findings of this report indicate that there are zones of deep fill on the site. Additionally those areas of shallower fill are underlain by clay of High Plasticity within the influence of trees. The proposed dwellings will require piled foundations.
- 3.2.2 In the south-east corner of the site a void was encountered between 10.5 and 12.5 metres below ground level. Further enquiries have revealed that there are two voids recorded on the site although their exact position has yet to be defined.
- 3.2.3 Minor contamination of the fill materials on the site was identified. Some minor remediation work will be required but it has been established that as the aquifer is some 70 metres below site level and there is not any significant groundwater. The risk to the aquifer is minimal. However the Environment Agency has not yet given written acknowledgement of this fact.
- 3.2.4 Further investigation is required immediately beneath the remaining buildings on the site. The buildings are mainly at the centre of the site in what is proposed to be public open space and it is anticipated that relatively simple remediation works will be required.
- 3.2.5 Gas monitoring was carried out for oxygen, carbon dioxide and methane. No methane was recorded and the maximum level of carbon dioxide recorded was at 3.1% requiring ventilation of sub-floor spaces beneath buildings.
- 3.2.6 Particular care will have to be taken with the disposal of surface water to prevent development of solution holes by leaching of fines from the Reading Beds into the underlying chalk.

3.3 Demolition

A specific assessment for risks associated with demolition was not carried out. However reference should be made to Geo-Environmental Services Ltd paragraphs 5.5 and 7.0 for general advice on demolition. The demolition contractor must report any signs of contamination or unusual ground conditions encountered.

4.0 FURTHER INVESTIGATION

4.1 General

The presence of the existing factory buildings, and continuing production, combined with the hardstanding areas has prevented investigations of every aspect of the site. Identification of certain features on the site has indicated the need for further investigation that is summarised below:

4.2 Investigations Required for Foundation Design

When demolition has been completed and the site stripped of all hardstanding areas an inspection of the formation should be made to establish any disturbed areas that would indicate zones of fill material.

The data already obtained indicating the presence of voids on the site should be developed and may well require the use of geo-physical site investigation methods such as micro-gravity or impulse radar.

4.3 Contamination Assessment and Remediation Measures

Further investigation will be required within the area of the main factory building that could not be assessed fully at the time of the GESL investigation. This will involve further trial pits, sampling and analysis of samples.

5.0 **REMEDIATION**

- 5.1 The remediation required due to the presence of contaminants in the subsoils is as identified in section 5.4 of the GESL report. The report proposes that the upper 400mm of soil be removed from areas of proposed domestic gardens and replaced with clean certified fill material. The requirement, from current investigation appears to be limited to the central and western portions of the site.
- 5.2 In section 6.1 of the GESL report it is suggested that remedial work to protect the aquifer from contaminated groundwater is not required.
- 5.3 Any voids identified, as a result of the geo-physical site investigation will require stabilisation.

6.0 CONCLUSION

6.1 Further Investigation

Further investigation for contamination should be implemented as soon as the site demolition and clearance has been completed.

The presence of voids on the site should be investigated.

6.2 Ground Stabilisation

In the zones of unstable ground and highly plastic clays piled foundations will be required for domestic dwellings. Consideration will have to be given to compaction and stabilisation of the ground prior to construction of roads, drives and underground services. Any underground voids must be stabilised.

6.3 Gas Protection

All dwellings should be provided with additional air vents to underfloor cavities to ensure dispersion of CO₂ gas. Ventilation should be provided in accordance with the recommendations of the Building Research Establishment report "Construction of New Buildings on Gas Contaminated Land". The report states that ventilated sub-floor voids should be provided with a minimum area of ventilation of 1,500mm² per metre run of wall or 500mm² per square metre of floor area whichever gives the greater area of opening. The voids should be well cross ventilated and there should be plenty of air gaps in sleeper or interior loadbearing walls beneath the floor units.

6.4 Management of Contaminated Material

All displaced contaminated materials should either be disposed of to a registered tip or placed in a zone of low risk within the site. An ideal location would be beneath the central public open space.

Following establishment of the volumes of material to be moved provision can be made to encapsulate any contaminated subsoil within an impermeable membrane to prevent the risk of leaching of contaminants. Inert fill should then be placed over the contained contaminants to sufficient depth to allow the establishment of planting and recreation areas.

Signed

John Newton

CEng, MICE

For and on behalf of John Newton & Partners

Appendix 1

Geo-Environmental Services Ltd Report