Preliminary Engineering Report to support Archaeological Excavations

at

Site of Former Mother and Baby Home, Tuam, Co. Galway

REPORT

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1. Client

Office of the Director of Authorised Intervention (ODAIT), Tuam Customs House, Flood Street, Galway.

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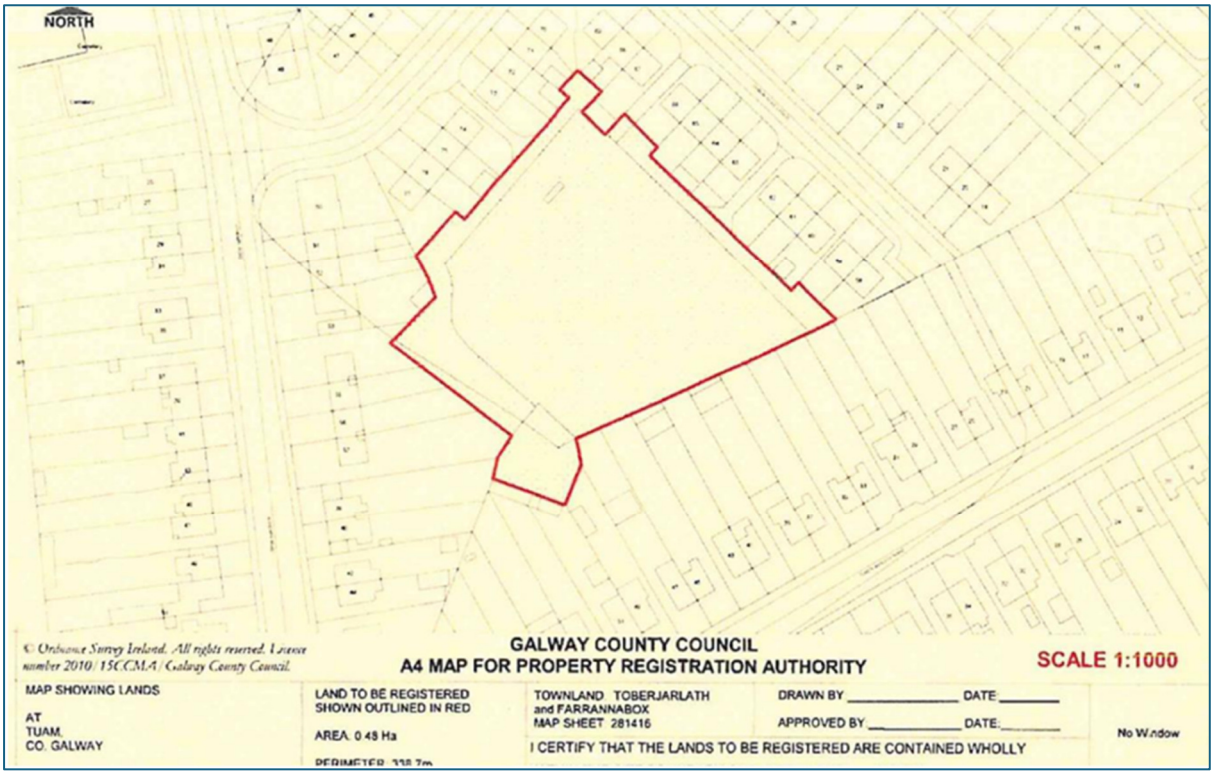
2. Location

The site of the former Mother and Baby Home is located at Dublin Road, Tuam Co. Galway. The site (identified in the map in Map 1) that is the subject of ODAIT's mandate measures approximately 1.2acres / 0.46Ha and is currently bounded by housing. The former Tuam Union Workhouse was partially located on this site. It is now an area of forensic archaeological interest as it was reportedly a burial ground for children from the Mother and Baby Home that operated there between the 1925 and 1961.

Please see Appendix B for reference locations of the Photographic Survey of site and Appendix C containing historical maps showing part of the former workhouse on the subject site.

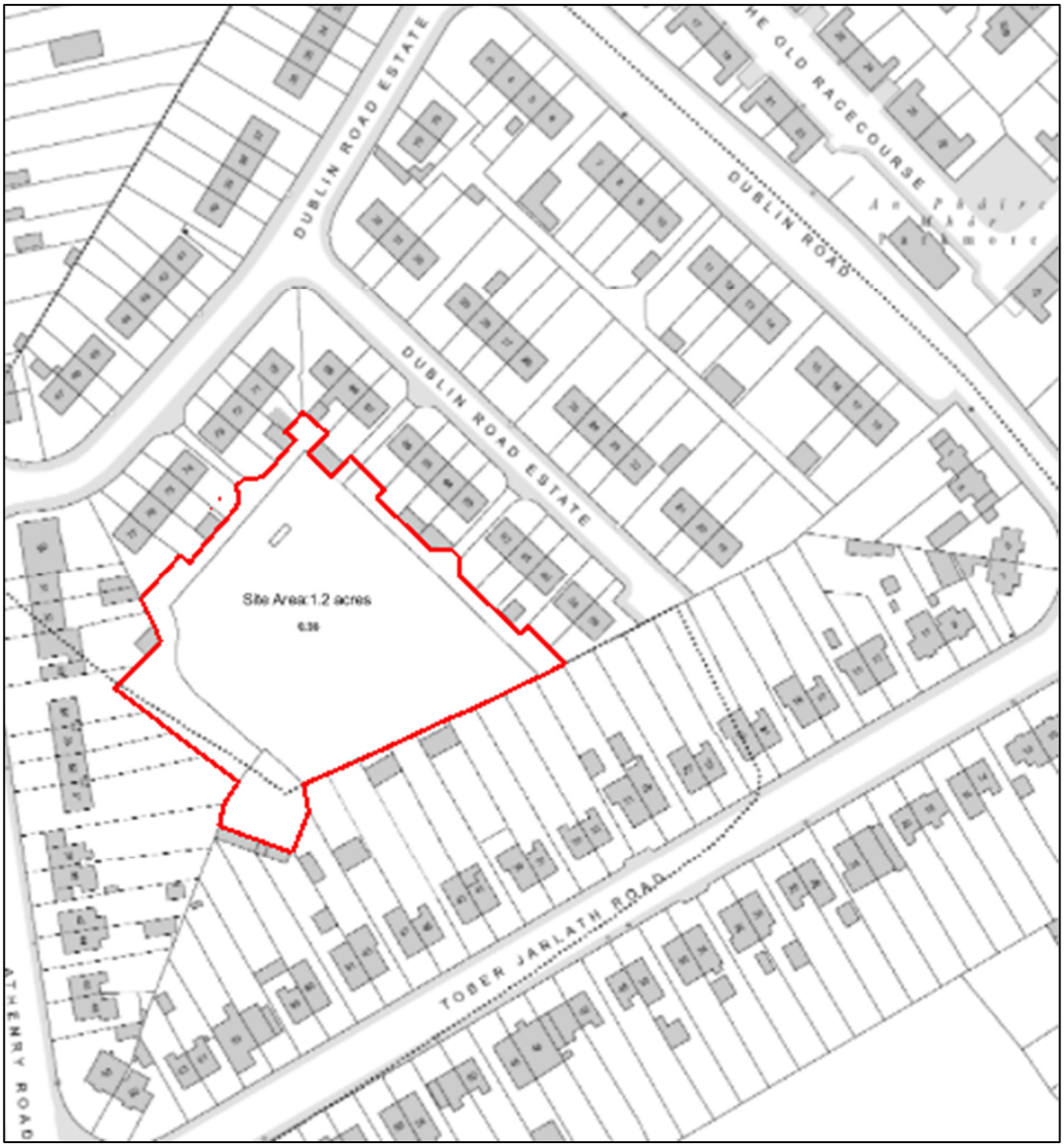


Map 1: Site Location Map, appended to the Institutional Burials Act 2022 (Director of Authorised Intervention) Order 2022, SI No 518 of 2022.

3. Brief

ODAIT was established in 2023 by the Minister for Children, Equality, Disability, Integration and Youth. ODAIT's objective is to recover, identify and re-bury in a respectful and appropriate manner, the human remains buried at the site of the former Mother and Baby Home in Tuam. To achieve this objective ODAIT is tasked with carrying out excavations at this location (see Map 2 for the subject site).

Engineering advice was sought in advance on the necessary excavation and enabling works required to safely excavate to depths as required within this confined area. The expected depths of excavation could exceed 1.5m in places, as determined by the Forensic Archaeologist.



Map 2: Extent of subject site (outlined in red) (© Ordnance Survey Ireland

4. Review / Assessment

Based on a review of the previously commissioned Expert Technical Group (ETG) report (Technical Report on the Tuam Site, 2017), ODAIT proposes that the site is divided into four zones, or phases, for excavation based on forensic archaeological advice.

It is proposed that the site be excavated by what is referred to as 'Open Area Excavation' in a phased approach, moving from Zones 1 to 2 to 3 to 4 (see four zones in Figure 4). In this method the overburden is removed in a sequential manner across each zone. Anomalies, as identified by the archaeologist, will be excavated in a systematic and controlled manner, manually and with machine. If further excavation works are required in close proximity to boundary walls of adjoining properties or structures, temporary retaining solutions may be required to protect personnel and findings along with existing boundary walls or structures.

Zone 4

Zone 4 requires a specific and specialised approach as it features the Memorial Garden where human remains have been found in a subsurface structure (Technical Report on the Tuam Site, 2017). This subsurface structure is composed of a 19th century stone walled tank measuring c.12m x 8m. Located within this tank on the southern side is a multi-chambered subsurface structure made of concrete, which was likely built in the 20th century. This multi-chambered subsurface structure is separated into 20 narrow conjoined chambers each measuring c. 1.25m x 0.64m x c.2m in depth (internal), with 21 openings at the top. The base of this structure is c. 2.7m from the current ground level (see Figures 1, 2 and 3).

Concerning Zone 4, it is required that the full extent of the zone is excavated, and human remains recovered. Retaining wall structures will be required for zone 4 to protect the bounding walls and outbuilding structures / sheds that adjoin the Memorial Garden.

Within Zone 4, there is a strong possibility that the area to the west of the Memorial Garden will also contain human remains based on previous findings and investigations from the Expert Technical Group (Technical Report on the Tuam Site, 2017).

Figure 1: Photograph of multi-chambered subsurface structure (Mother and Baby Homes Commission of Investigation, fifth interim report 2019, appendices)

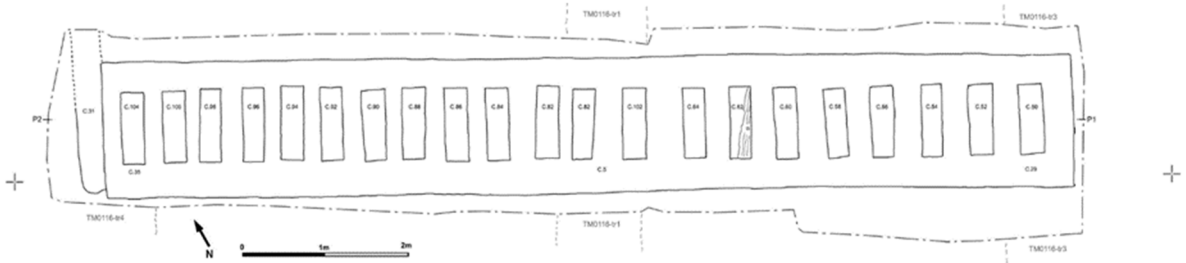


Figure 2: Plan of multi-chambered subsurface structure (Mother and Baby Homes Commission of Investigation, fifth interim report 2019, appendices)

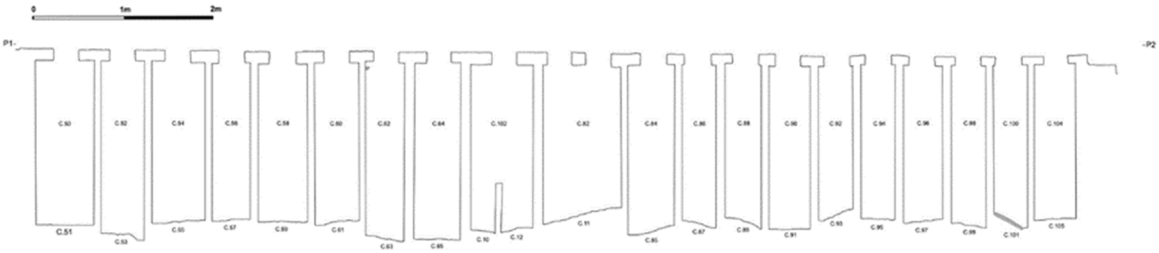


Figure 3: Section of multi-chambered subsurface structure (Mother and Baby Homes Commission of Investigation, fifth interim report 2019, appendices)

5. Proposed Methodology and Sequencing for the excavation of Entire Site

The methodology presented here is for the purposes of illustration. It is acknowledged that further investigative works will influence any proposal. It is proposed that the excavation of the site is to be carried out in four phases. For that purpose, four individual excavation zones are identified as indicated at Figure 4 below.

Design will need to provide for the removal of material from site e.g. current playground furniture, blacktop, and debris from the workhouse building that is below the surface.

Design will also need to provide for a site compound. The site compound must contain necessary welfare facilities, drying room, tool and equipment storage, meeting rooms and offices and secure storage. Size of recommended porta cabin units to be 30ft cabins (9.1mx3.05m), potentially stacked to accommodate approx. 30 people on site.

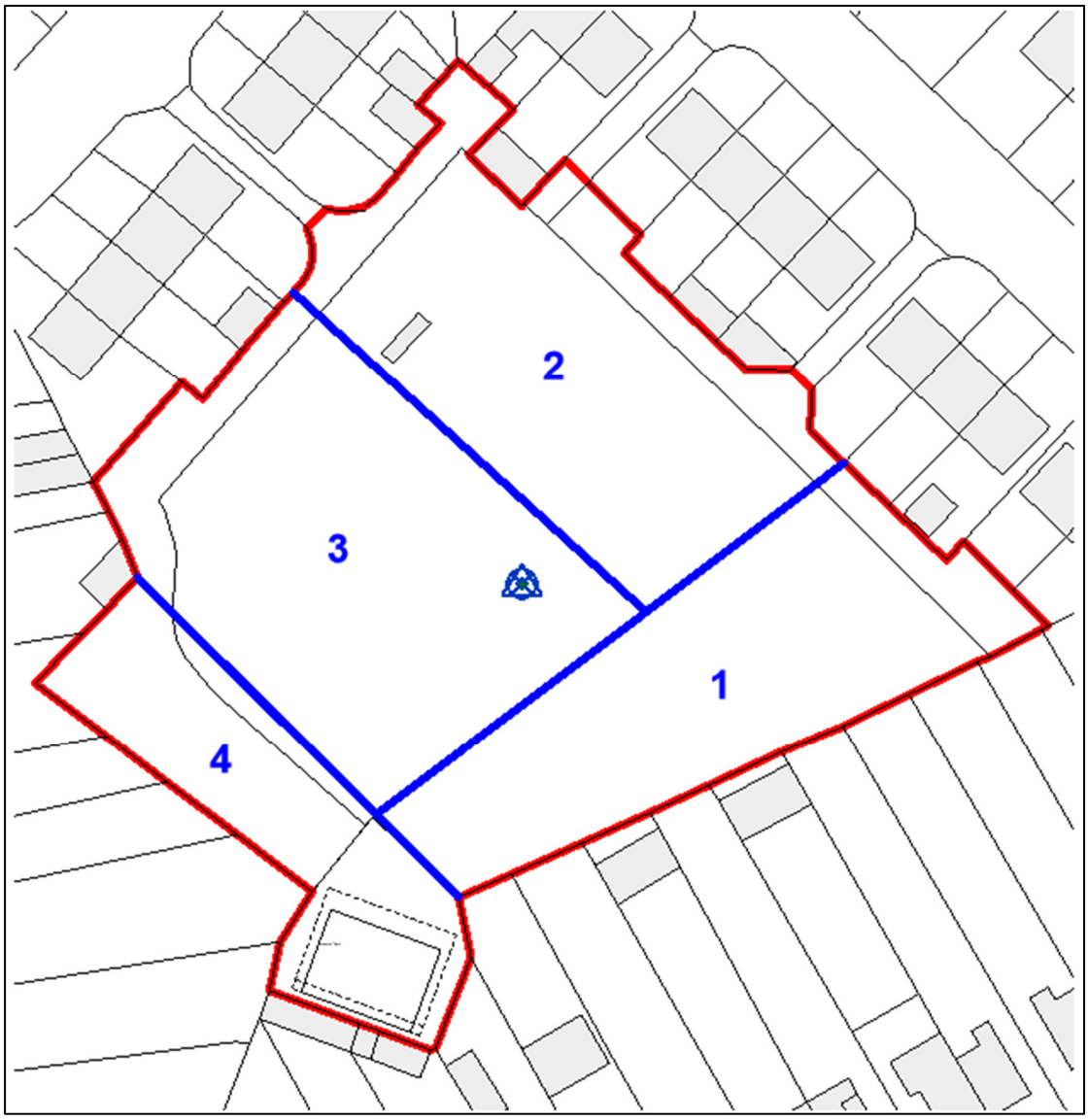


Figure 4: Phased Zones

Proposal for Phase 1 - Zone 1 (see figure 5 below)

Excavation works are to be battered back to a safe slope from the boundary of the zone, the typical angle of repose would be 30 degrees. The site is to be excavated to reach undisturbed ground or where a discovery of a significant nature is made. In some locations, depths may exceed 1.5m. All soil removed from Zone 1 will be located in Zone 3. On completion of Zone 1, all excavated soil to be reinstated to Zone 1 and soil compacted.

The site compound is proposed to be located in Zone 2 while work is undertaken in Zone 1, at a location to be agreed with ODIAT.

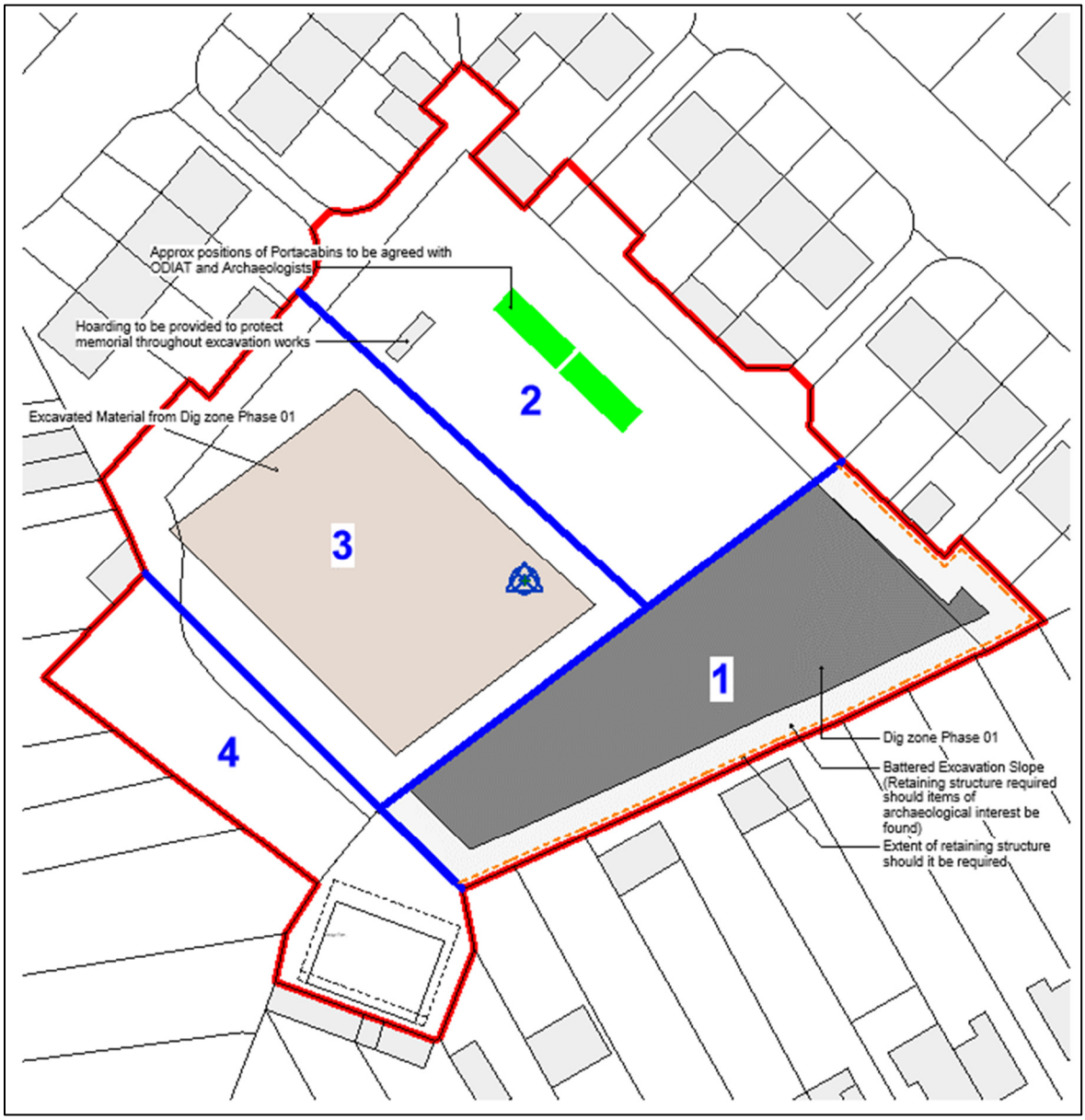


Figure 5: Zone 1

Proposed for Phase 2 - Zone 2 (see figure 6 below)

Excavation works are to be battered back to a safe slope from the boundary of the zone, the typical angle of repose would be 30 degrees. The site is to be excavated to reach undisturbed ground or where a discovery of a significant nature is made. In some locations, depths may exceed 1.5m. All soil removed from Zone 2 will be located in Zone 3. On completion of Zone 2, all excavated soil to be reinstated to Zone 2 and the site compound is to be relocated to Zone 1 where it is proposed it will remain for the duration of works.

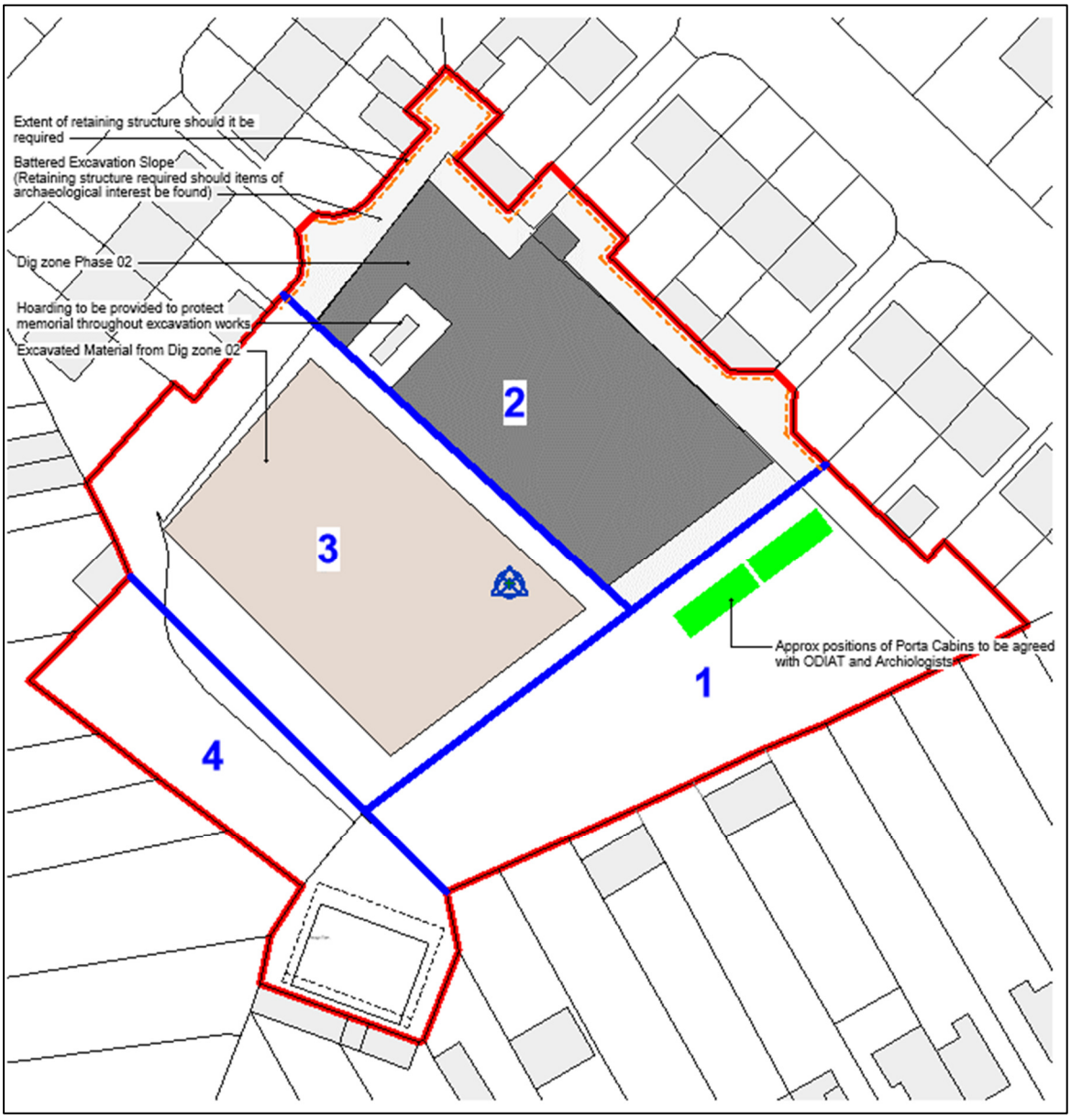


Figure 6: Zone 2

Proposal for Phase 3 - Zone 3 (see figure 7 below)

Excavation works are to be battered back to a safe slope from the boundary of the zone, the typical angle of repose would be 30 degrees. The site is to be excavated to reach undisturbed ground or where a discovery of a significant nature is made. In some locations, depths may exceed 1.5m. All soil removed from Zone 3 will be located in Zone 2. On completion of Zone 3, all excavated soil to be reinstated to Zone 3 and soil compacted.

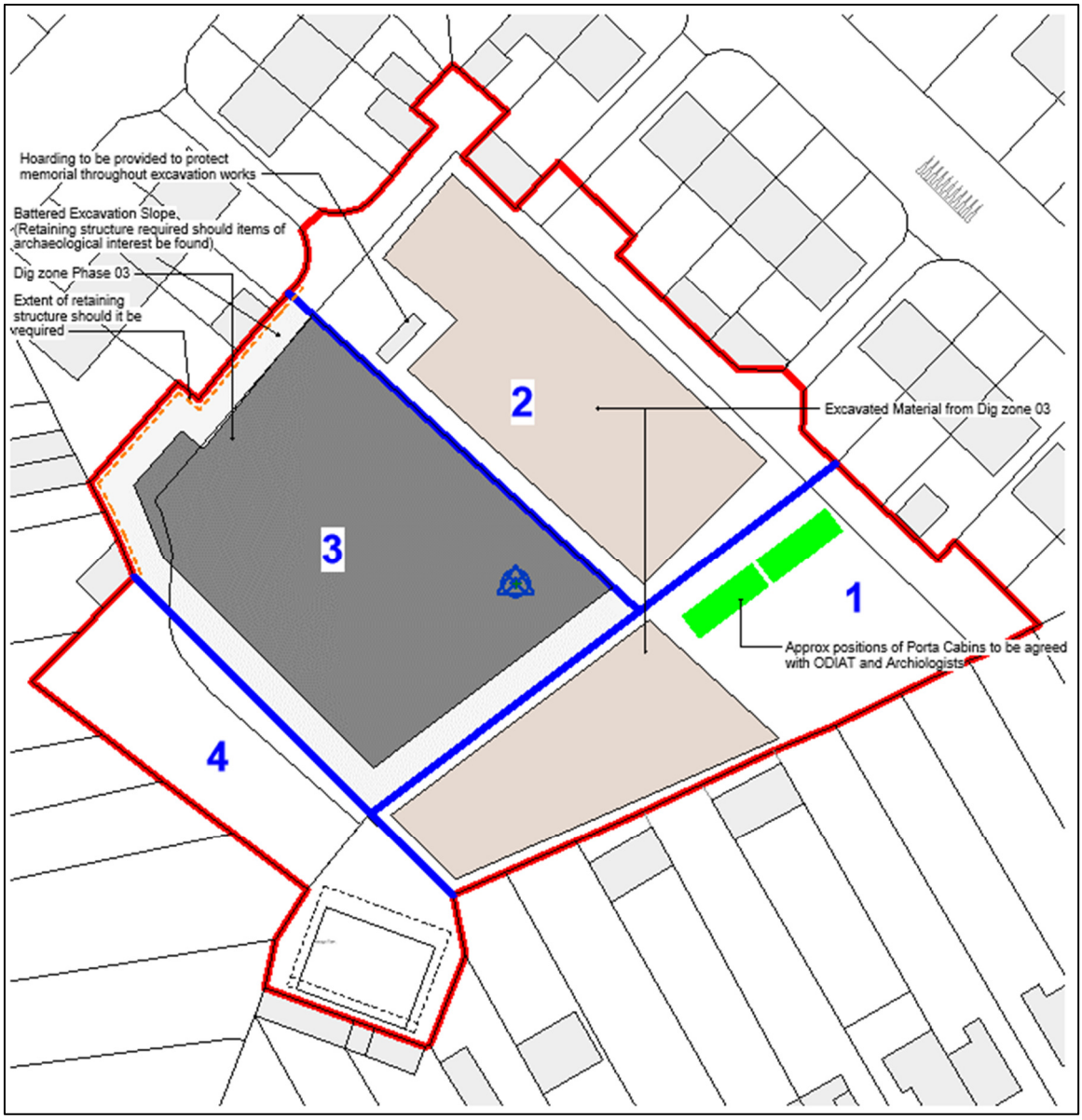


Figure 7: Zone 3

Proposal for Phase 4 - Zone 4 (see figure 8 below)

Excavation works are to be battered back to a safe slope from the boundary of the zone, the typical angle of repose would be 30 degrees. The site is to be excavated to reach undisturbed ground or where a discovery of a significant nature is made. In some locations, depths may exceed 1.5m. All soil removed from Zone 4 will be located in Zone 3.

Zone 4 contains the multi-chambered subsurface structure containing infant human remains.

See proposed methodology and sequencing in Section 6 for an excavation method for the Memorial Garden. On completion of Zone 4, all excavated soil to be reinstated to Zone 4 and soil compacted.

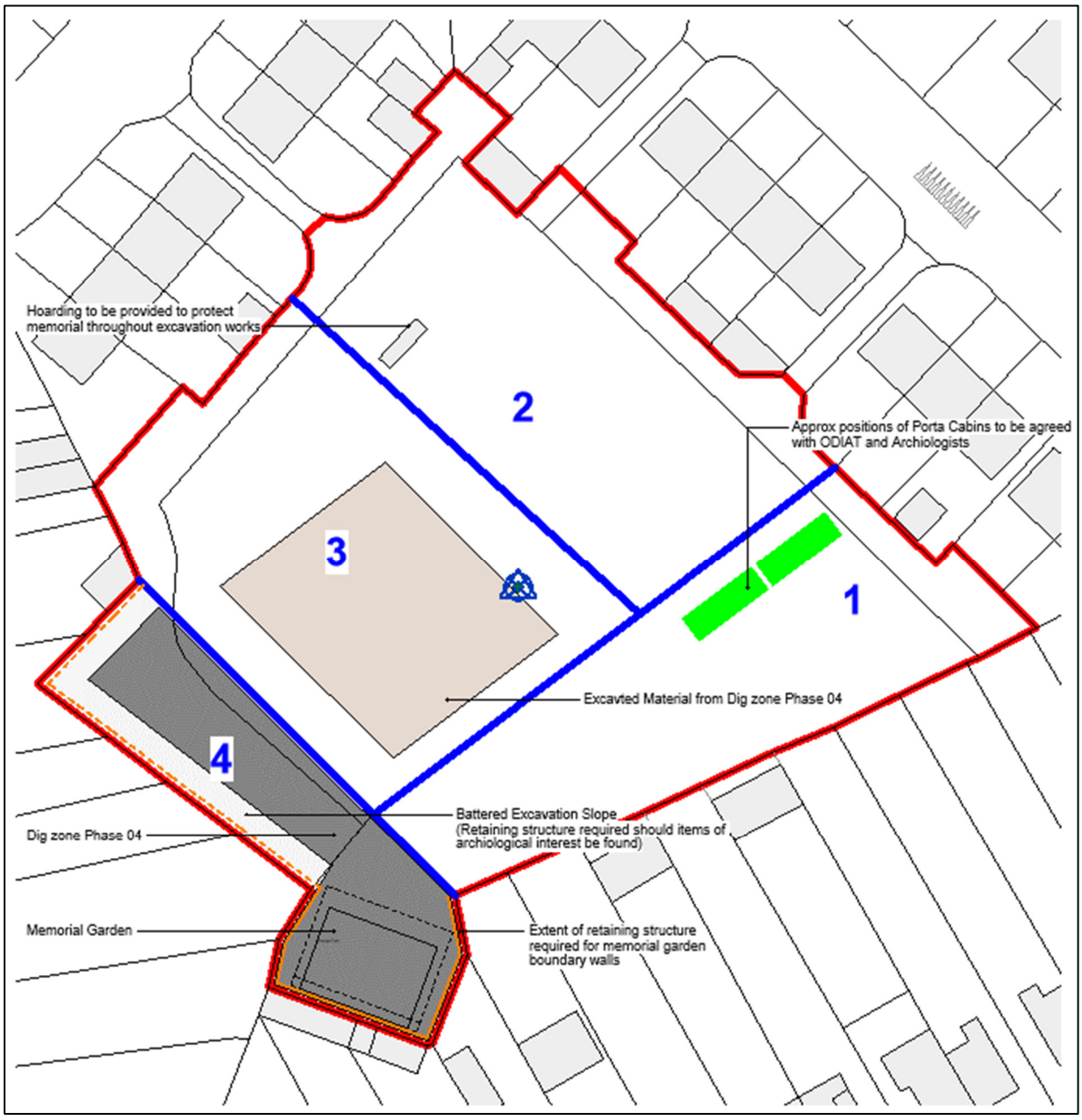


Figure 8: Zone 4

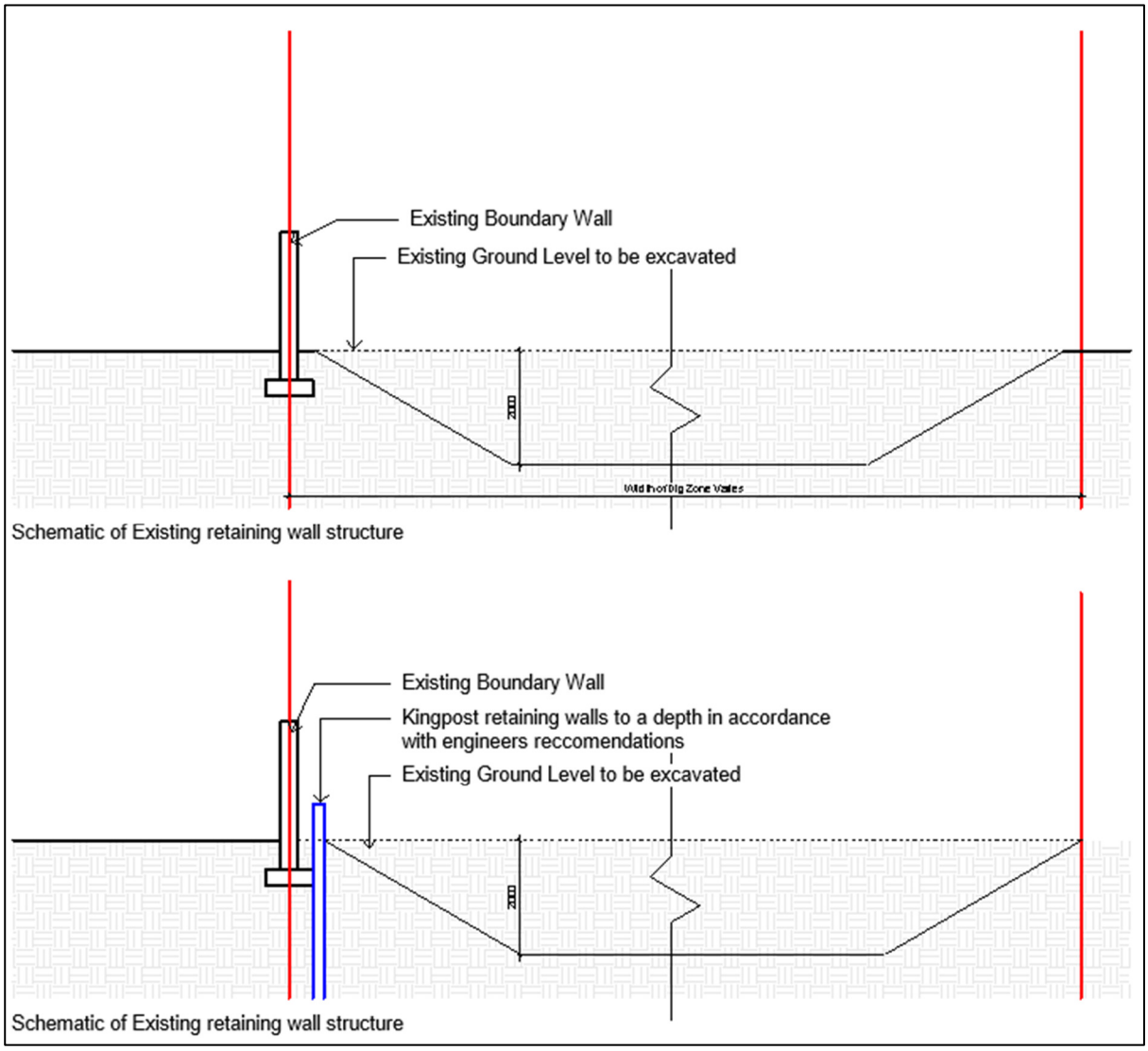


Figure 9: Schematic of Excavation and Retaining Structure

6. Method Statement for the excavation of the structure (concrete capped multi-chamber structure – Dig Zone 4) in the Memorial Garden

The methodology presented here is for the purposes of illustration. It is acknowledged that further investigative works will influence any proposal.

In excavating the structure to remove the human remains, it is necessary to support the southern boundary (Toberjarlath Road) wall and western wall of the Memorial Garden, or alternatively the boundary wall and shed need to be demolished in order to allow access to works.

Along part of the southern boundary wall on the opposite to the Memorial Garden, garden sheds have been built that rely on the boundary wall as the rear wall of the shed, creating a party wall structure. It is necessary to put in either a retaining wall structure or alternatively extend the excavation into the adjoining properties by battering back the excavation (creating a safe slope).

The options include:

1. Removal of Sheds and garden wall

   The removal of the structures above ground allows for excavation to battered back to safe slope, the typical angle of repose would be 30 degrees.

   The main advantages of this method is it provides for the least potential for disturbance of entombed human remains, it has a greater impact on the adjoining property owners / residents, due to temporary loss of their sheds, boundary walls, and the need to work in their gardens.

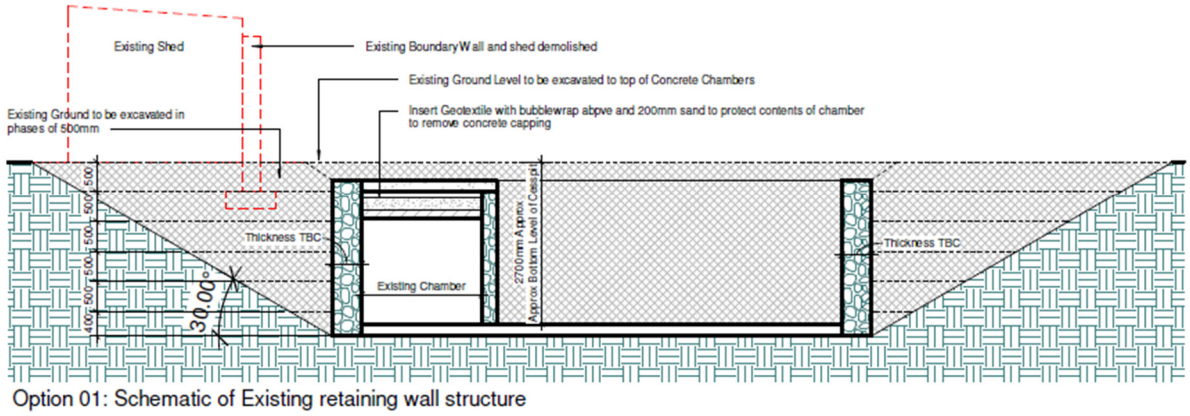


Figure 10: Schematic section through concrete tank

2. Use of sheet piles and retaining structure

   Sheet piles are driven into the ground with a percussion hammer fitted to a heavy excavator or piling rig. Sheet piles are best suited to homogenous soils, sand, silt, clays. Where there is the potential for boulders, or obstruction (filled ground), the sheet piles are unlikely to be suitable as it will lead to disturbance and excessive vibration to the subject excavation works and adjoining properties.

3. King Post Retaining Wall series of H pile 1-3m apart, with railway sleepers inserted between the posts.

   The main advantage is the H pile can be fitted close to the boundary walls. It is necessary to auger a hole to H Pipe, the pile is placed and set in concrete at the bottom of the pile. There is minimum noise and vibration relative to the sheet piles. There is a need to install the temporary retaining wall between the boundary walls and walls of the underground tank. The timber sleepers are installed in phases as the excavation gets deeper.

   The stone wall features that bound the tank (approx. 440mm at top) would also have acted as retaining wall structures for the concrete tank. It is probable that the walls provided an element of filtration (to allow effluent to soak into the adjoining ground).

   It is advisable to install the retaining structures or alternatively removal of sheds / garden wall in advance of the removal of topsoil capping / overburden over the Concrete Capped structure. The existing capping /overburden provides a measure of protection from the machinery. It would be advisable to overlay the ground with steel plates (road plates) to spread out the weight of tracked excavator.

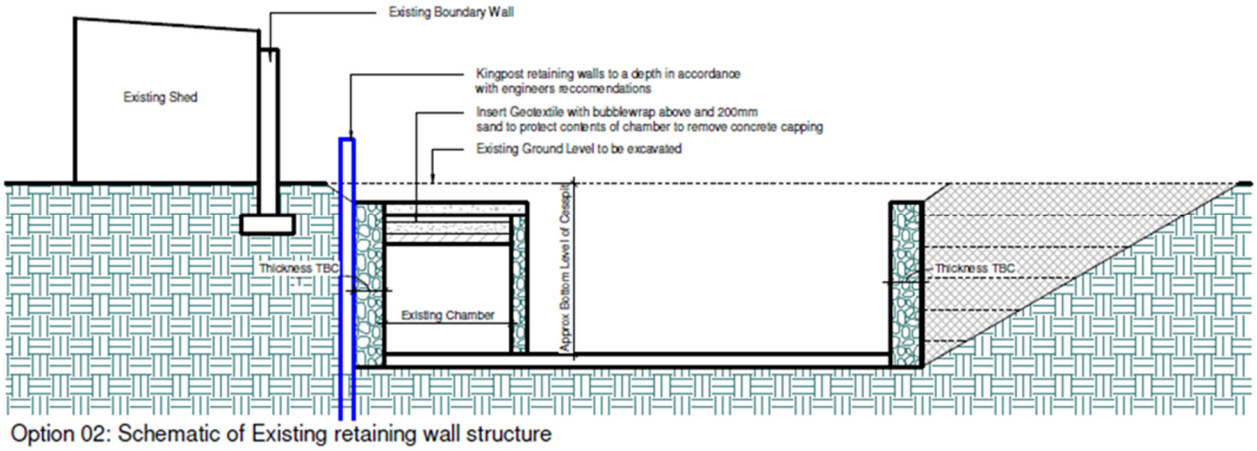


Figure 11: Schematic of retaining structure to concrete tank.

Once the retaining structure is in place, the excavation of the chambered structure can take place. A detailed site specific plan will need to be designed in consultation with the consultant Engineer, the Health and Safety Advisor and the excavation team, however the following is a suggested approach:

Suggested indicative methodology:

1) Record chambered structure, internally and externally.
2) Gas monitoring, personal protective measures based on risk assessment from Health & Safety Advisor.
3) Remove concrete covers (concrete lids)
4) Protect human remains within
5) Cut the concrete slab into sections that can be lifted in manageable sections. It is possible to locate a telescopic handler (long reach outside the excavation area to facilitate lifting of concrete sections.

6) Cut out sections of concrete walls.
7) Excavate and recover the human remains as per requirements of the forensic archaeologist.
8) Repeat process for each chamber.

Primary Considerations in Excavation of Chambered Structure:

- Safe access for personnel
- Impact on adjoining properties and structures
- Protection of human remains within, outside of, and abutting the chambered structure.

Notes:

- It is possible to recreate or mock up the concrete structure in advance of carrying out the works on site should the excavation team deem it necessary to test the adequacy of the procedure and the protection measures for the human remains.

- Cutting concrete walls create concrete dust, this can be suppressed with water. The impact on the archaeological remains would need to be considered. Given the concrete tank walls are relatively narrow, it may be more appropriate to drill a series of holes to weaken the walls along the desired cut line.

7. Schedule of Services / Schedule of Surveys

1. Consultant Engineer:

It is intended to appoint a consulting Civil Engineer to support the work of ODAIT and to provide advice. The engineer's works include the following:

- Instruct and review site investigations, or other surveys in conjunction with ODAIT and Forensic Archaeologist.
- Prepare a method statement for safe excavation of site developed on preliminary reports.
- To design the temporary retaining wall structures and berm excavations to facilitate archaeological excavations. Manage groundwater levels in excavations, this should include for the licensing of the pumping / disposal of any excess ground water to council sewer.
- To manage the safe storage of excavated soils on site (stockpiles of earth) and manage the reinstatement and consolidation of the excavated soil.
- Support ODAIT in the provision of a site compound, this should include accommodation and welfare facilities, storage, site hoarding and services.
- Support ODAIT in the protection of adjoining and adjacent properties including dwellings, outbuildings, and boundary walls.
- To advise ODAIT on the appointment of the ancillary consultants listed below.

2. Topographical Survey

We would advise that a topographical survey of the subject site be carried out. The survey should include the houses backing onto the subject site, the rear gardens, outbuildings, and garden walls that bound the site. The survey should include contours, spot levels, positions of boundaries, adjoining properties and so on.

The survey should also establish control survey points that can be referenced throughout the course of the excavation works.

The engineer should consider if an element of monitoring is required. The objective of the monitoring is to determine whether the excavation works within the subject site has any impact on adjoining houses such as settlement or cracking of walls. The survey of the adjoining properties will complement the dilapidation survey.

3. Pre-works Schedule of Condition

Detail the general condition of adjoining buildings or structure, including recording any existing cracking and damage. Pre-works Schedule of Condition (also referred to as schedule of dilapidations) are carried out by Chartered Building Surveyor prior to any major adjacent construction works including demolition, drainage works or pipeline, construction that could impact on adjoining property owners. The survey would include a photographic record, commentary on any existing cracks and general condition.

4. Existing Underground and Overground Utility Services

The record maps from Galway County Council, Utility Providers (e.g. ESB, Eircom and so on) are needed to determine what, if any, services are situated within the subject site. The Engineer should also organise for a CCTV survey of the Foul and Surface Water Drainage that serve the

housing that bound the Northern and Western sides of the subject site. The position of drains within the subject site should be added to the topographical survey.

Any existing services which effect the subject site may need to be decommissioned or diverted to facilitate the excavations.

Site services will be required for onsite accommodation (portacabins). Services include water, electricity, broadband, drainage and so on.

5. Geotechnical Investigation

The underlying strata is limestone, the original overburden is likely to be boulder clay. The subject site was formerly the site of Tuam Union Workhouse dating from the 1840s, the workhouse has been demolished and the area was developed for housing by the local authority in the 1960s /1970s. There is likely to be considerable areas of filling, potentially the remains of the foundations of Tuam Workhouse and demolition waste related to the workhouse.

The engineer should organise a site investigation report, in order to inform them of the underlying ground conditions, to determine the location of the water table and to provide coefficients or parameters for the safe design of slopes and retaining structures. The locations of trial holes and bore holes need to be established in consultation with the Consultant Forensic Archaeologist.

6. Health & Safety Consultant

Appoint a Health and Safety Consultant. I refer to the Shorcontrol Safety Ltd report dated 23/08/2017 (Technical Report on the Tuam Site, 2017, Appendix H). Shorcontrol highlighted that the site is determined to be a construction site, the SHWW Act 2005 (Safety, Health, and Welfare at Work Act 2005) and the SHWW Construction Regulations 2013 should be complied with.

Given the nature of the works, the history of the site and the interface with public and residents, the project warrants a Health & Safety Plan. The Health & Safety Plan will have to be done in consultation with the ODAIT, the Forensic Archaeologist, and the Consultant Engineer.

7. Quantity Surveyor

The following services are required:

- Site Hoarding (extent of site works could change over time depending on the results of the excavation)
- Site Accommodation (Portacabins), Sanitary & Welfare Facilities, Storage of evidence/artefacts / human remains). Provision of site services lighting, CCTV,
- Provision of Support Services to Forensic Archaeologists, including retaining wall, propping of boundary walls, excavation of works. Protection of Works from weather.
- Co-ordinating storage and reinstatement of material from excavations (Soil, Rubble)
- The Quantity Surveyor in conjunction with the engineer will prepare a tender pack for a site enabling contract. Items such as the site accommodation and the hoarding are relatively easy to price. It may be a matter of providing rates and suggested timeframes for attendances.

8. Project Manager

We would advise that a project manager should be appointed on behalf of the ODAIT to realise the project in a timely manner. There is an element of co-ordination of engineers, surveyors, archaeologists, liaison with adjoining property owners, and members of the public.

The consultant engineer, or the quantity surveyor may have capacity to provide a project management role if required, alternatively the ODAIT may decide to engage employ a project manager directly for the role.

Appendix A: Shoring / Hoarding Options

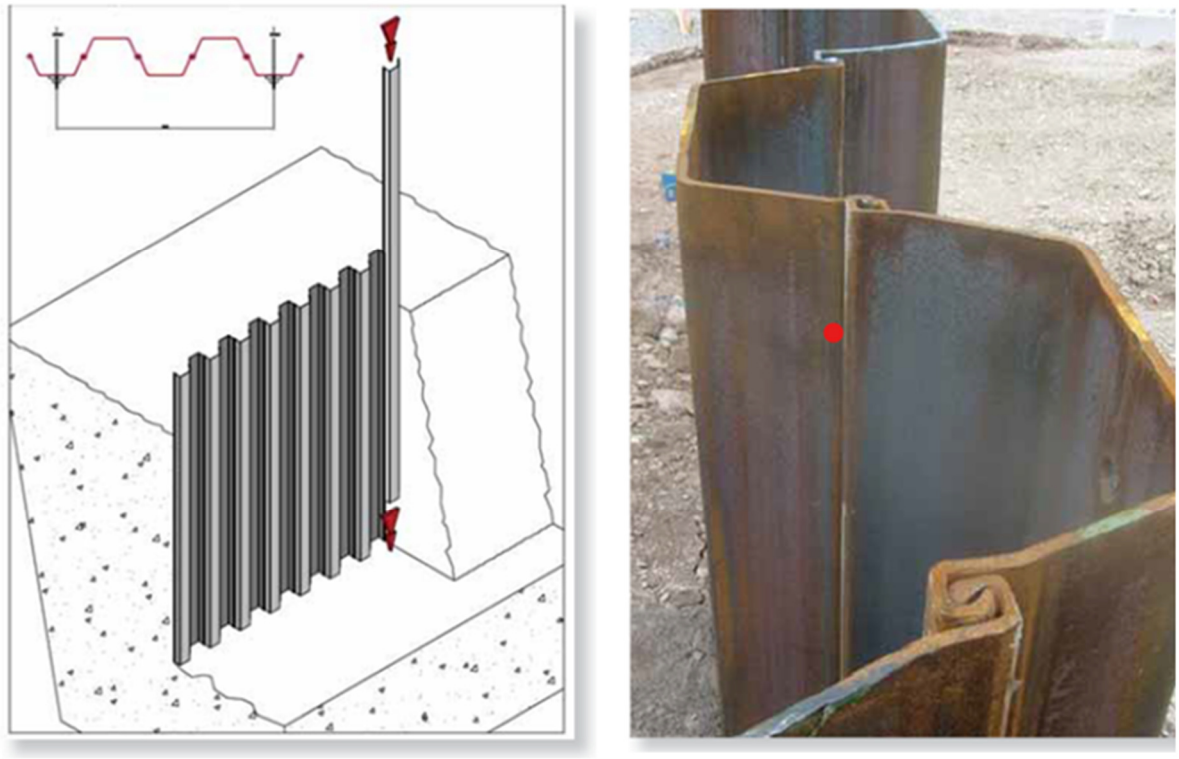


Figure 1: Example of Sheet Piles

Figure 2: Examples of King Post shoring.

Figure 3: Hoarding supported with concrete Kelly blocks - Avoids the need for excavations for hoarding.

Figure 4: Example of berm excavation.

Figure 5: Example of privacy hoarding to boundary walls.

Figure 6: Example of stacked Portacabins.

Figure 7: Example of sheet metal hoarding (front and rear)

Appendix B - Photographic Survey

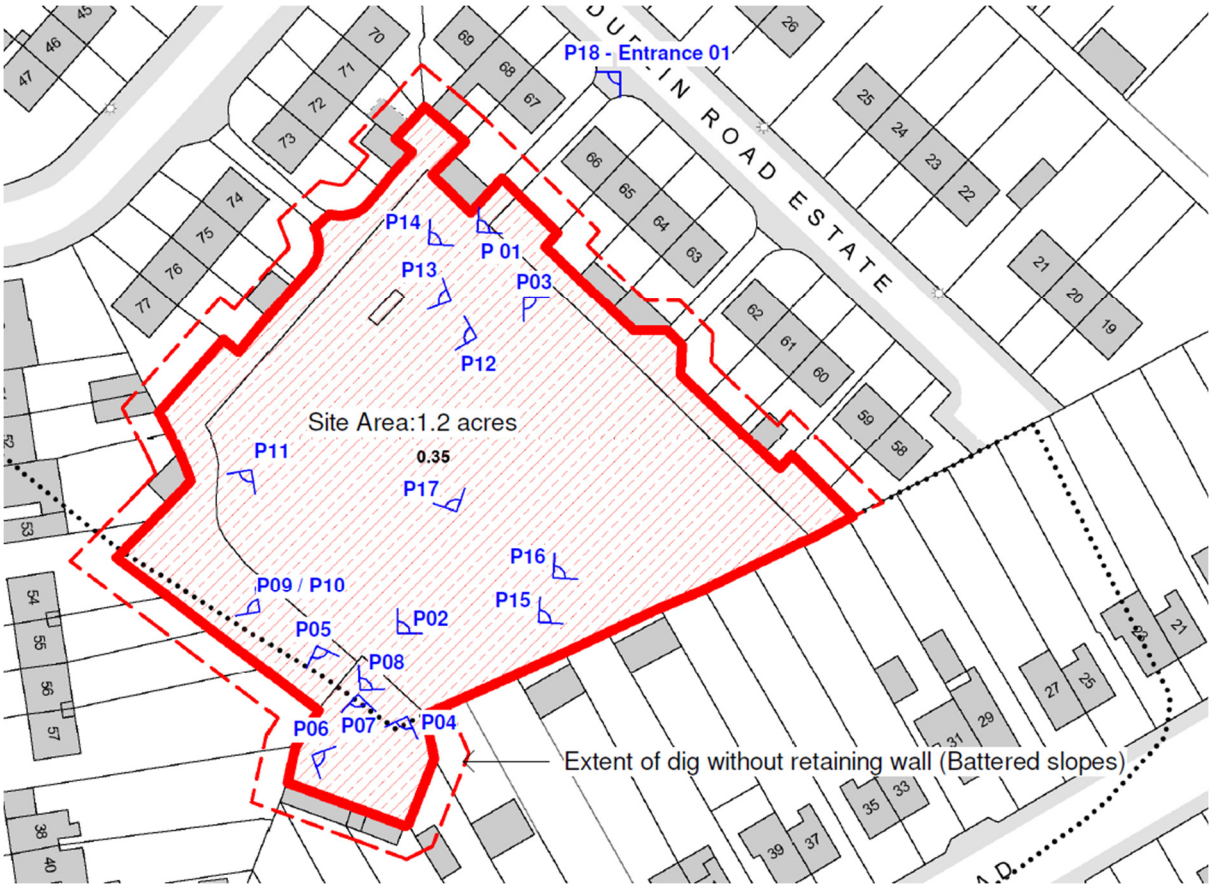


Image 1: Entrance from interior side of Dublin Road Estate (approx. width 3.3m)

Image 2: Existing Playground

Image 3: Pedestrian access to rear gardens of Dublin Road estate

Image 4: South boundary wall of memorial garden

Image 5: Pedestrian access to memorial garden

Image 6: Eastern boundary wall of memorial garden

Image 7: Southern boundary wall of memorial garden

Image 8: View towards playground from memorial garden

Image 9: Hardstanding to rear of dwellings on Athenry Road

Image 10: Hardstanding to rear of dwellings on Athenry Road

Image 11: Hardstanding to rear of dwellings on Athenry Road

Image 12: Commemorative plaque set within surviving portion of chapel / dining hall wall.

Image 13: Western access to Dublin Road estate

Image 14: Access route to Dublin Road estate north

Image 15: Existing south-eastern boundary wall of former Tuam Workhouse onto Tober Jarlath Road

Image 16: View from playground to northern boundary onto Dublin Road estate

Image 17: View from playground to northern boundary of Dublin Road estate north

Image 18: Entrance to site from Dublin Road estate north

Appendix C – Historic maps overlaid with subject site.

Map 1: Historic 6 inch map showing former workhouse.

Map 2: Modern map with footprint of former workhouse overlaid.