

STRATEGIC INFRASTRUCTURE DEVELOPMENT
APPLICATION TO AN BORD PLEANÁLA
(REG NO. PL04.PA0045)

ORAL HEARING

RESOURCE RECOVERY CENTRE,
RINGASKIDDY, COUNTY CORK

WITNESS STATEMENT OF JOANNA O'BRIEN

SOILS, GEOLOGY, HYDROGEOLOGY AND HYDROGEOLOGY

1. Qualifications and Experience

My name is Joanna O'Brien. I hold an honours degree (BE) Civil Engineering, University College Cork (1980), a masters degree (MEngSc) Geotechnical Engineering, University College Cork (1990). I am a Chartered Member of the Institute of Structural Engineer (IStructE) and a Member of Engineers Ireland.

I am an Associated Director with Arup and head up the Geotechnical team in the Cork Office since 1990. I have completed a number of international secondments abroad, including London (1988-91, 2012), Hong Kong (1993-96), Bangkok (1998), Brisbane and Melbourne (2009) and Newfoundland, Canada (2012-13).

Between 1980 and 1990 I worked as a civil/structural engineer and since 1990 I have specialised in geotechnical engineering design. I have been involved in the geotechnical engineering design of numerous projects in the Ringaskiddy area since 1989.

Arup is a multidisciplinary firm of consulting engineers based in Ireland. Arup prepared the environmental impact statement (EIS) for the Ringaskiddy Resource Recovery Centre.

2. Role in the Project

My role in the project is to overview the geotechnical suitability of the site for the development and to provide geotechnical input to any and all aspects of the project where required and to oversee the preparation of the EIS chapter on Soils, Geology, Hydrogeology and Hydrology.

2.1 Conclusion of the Soils and Geology Section 13 of the EIS

- The ground conditions on site are such that the geotechnical design requirements for the project are typical of the Ringaskiddy peninsula. Given the available geotechnical data it is anticipated that the foundation and construction requirements will be those typically standard within the industry.
- The development will have minimal negative impact on the soils, geology, hydrogeology and hydrology of the site.

3. Submissions and Responses

In preparing this witness statement, I have considered each of the observations submitted to An Bord Pleanála by various parties in relation to the geotechnical aspects of the project. I have addressed each of them in the following table.

Response to Submissions on Soils, Geology, Hydrogeology and Hydrology

	Geotechnical, Geology and Hydrogeology	Comments
1	<p>Shane Bennett Report- CHASE Submission</p> <p><i>“The northern part of the site is underlain by high-yielding karstified limestone. This is structurally and hydrogeologically significant.”</i></p> <p>Presence of limestone significant in relation to groundwater vulnerability.</p>	<p>The regional and site geology are addressed in Sections 13.3.1.1 and 13.3.1.2 of the EIS</p> <p>The GSI Sheet 25 is not in agreement with the findings of the site investigations which show a green grey sandstone occurring in MW-1 of the Hammond Lane site investigation. MW-1 is located at the northern edge of the site.</p> <p>Reference to the available geological mapping of the area shows limestone to occur to the north of the development site. The available geological mapping is as follows:</p> <ul style="list-style-type: none"> • Circa 1840-1850 – Historic Geological Mapping – Figure 1 • Sleeman – Sept. 1987 – Cork Harbour 17-5NW – Figure 2 • Geological Map of the Cork District – Figure 13.1 of EIS <p>The Hammond Lane site investigation confirms that limestone does not occur under the northern end of the site. It clearly states this in section 4.2.4 in the EIS Appendix 13.2, and notes the anomaly with GSI Sheet 25.</p> <p>The Ballysteen Formation, a dark grey muddy limestone, may occur under the north west corner of the Western Field under the proposed new M28 road.</p> <p>The groundwater vulnerability rating of the site is dictated by the shallow depth of overburden rather than the site being underlain by limestone bedrock.</p>

	Geotechnical, Geology and Hydrogeology	Comments
2	<p>Shane Bennett Report- CHASE Submission</p> <p><i>“A large reverse fault runs E-W through the site. This is structurally and hydrogeologically significant.”</i></p> <p><i>Section 3 of Mr Bennett’s Report – It has been suggested that the soil from the site was used for reclamation and gave rise to the escarpment..... The escarpment is a natural geomorphological feature likely to have been carved by ice along a zone of weakness</i>”</p>	<p>The folding and faulting are addressed in Sections 13.3.1.1, 13.3.1.2 and Figures 13.1 of the EIS</p> <p>Geological mapping shows the fault to run to the north of the site and this is supported by MW-1 of the Hammond Lane site investigation.</p> <p>The escarpment (or steep cut slope) on site is a manmade feature. The ground levels along the line of the Martello Tower access path on 1934 OSi map are compared to the levels at the same locations in the current survey – this can be readily seen on the NPWS (National Parks and Wild Life Services) mapping that allows overlaying of the old OSi maps on the current aerial photographs. See Figures 3a and 3b.</p> <p>Geological faults are common throughout the Ringaskiddy peninsula. Due engineering regard is paid to the presence of faults and are readily dealt with by typical engineering solutions.</p>
3	<p>Shane Bennett Report- CHASE Submission</p> <p><i>“The site experiences groundwater and pluvial flooding with inflows from the escarpment and from springs. The significance of the site hydrogeology and its implication on drainage and construction, particularly with respect to water table are not reflected in the EIS,”</i></p>	<p>The suggestion of groundwater flooding of the site is addressed by Mr Ken Leahy.</p> <p>There is no indication of any naturally occurring springs in the earlier OSi maps which show the site prior to the cutting of the southern steep slope.</p> <p>Current water observed on site is considered to come from surface water run-off from the elevated ground to the south of the site.</p> <p>Inflow from the “escarpment” is considered in the design of the drainage system to be installed along the southern end of the site. This will be further addressed by my colleague Mr John MacCarthy.</p> <p>Construction under the water table will be dealt with by typical construction measures.</p>

	Geotechnical, Geology and Hydrogeology	Comments
4	<p>An Taisce's Submission</p> <p>4.2 – Exposure of site to Coastal Erosion and Access Route to Flooding</p> <p><i>The geology and hydrogeology of the site is such that there is an inflow of seawater into groundwater. This was established in the EIS for the first application ref: 04.131196, where the Inspector's report state that:</i></p> <p><i>The significance of this for the suitability of the site is that the site may not have any normal containment, so that, in the event of a spillage of hazardous chemicals or waste of some kind for loading and unloading operations (and human error cannot always mitigate against) there is the very real possibility that there would be contamination of groundwater and hence pollution of the harbour waters."</i></p>	<p>The sampling of groundwater on site does not support the claim that there is ingress of seawater under the site. The electrical conductivity of seawater is circa 55,000μS/cm. Groundwater sampling on site recorded the ground water conductivity in the range between 407 and 1002μS/cm (Page 74 of the KT Cullen report (SI 2000-2001) in Appendix 13.1). The Hammond Lane site investigation (July 2011) in Appendix 13.2 gives the groundwater conductivity range 776 to 969μS/cm which again is significantly below the conductivity of seawater.</p>
4	<p>HSE Submission</p> <p>Wells in Loughbeg Area</p> <p>Did Applicant take into account private wells that show up on GSI data when doing EIS?</p> <p>Were inquiries made to find out location of other private wells that are not shown on the GSI map?</p>	<p>Yes. These wells are addressed in section 13.3.3.2 of the EIS.</p> <p>No enquires were made to find out if there were wells in the vicinity, not recorded on the GSI map.</p> <p>Groundwater under the site is expected to flow northwards or northeastwards. The only potential groundwater receptors are to the north, the National Maritime College of Ireland and the Beaufort Building. Both are served by a potable water supply from Irish Water main. There will be no emissions to ground or groundwater from the proposed facility and very comprehensive measures, described in sections 5.11 and 13.8.2, 13.8.4 and 13.8.5 of the EIS, will be implemented to prevent spills or leaks entering the ground or groundwater</p>
	<p>Marcia Dalton's Submission</p> <p><i>Gobby Beach Earthcache</i></p> <p><i>"Construction would pose a risk of landslides both on the boulder clay cliff face and on the steep faces at the eastern side of the site(ref: EIS Section</i></p>	<p>The placement of the sacrificial beach material will not affect the viewing of the glacial till cliffs on Gobby Beach. The beach material will locally marginally raise the beach level/ with minimal visual impact on the cliffs</p>

	Geotechnical, Geology and Hydrogeology	Comments
	13.6)”	<p>themselves.</p> <p>The construction process will not pose a risk of landslides to the shore line cliffs. Refer to the section 13.4.4 of the EIS and the evidence of Ms Julie Ascoop.</p> <p>Within the site retaining structures will be constructed to retain vertical and sub-vertical soil and rock faces.</p>
	Cork County Council Submission	
1	<p>Environment – 6</p> <p><i>“The western field will be used for the construction lay-down areas and the construction facilities, following an initial phase of earthworks to raise the ground levels in this area i.e. the ground levels in the western fields area of the site consisting of a 10,000m² area will be raised by a maximum height of 2.5m above ground level. Clarification should be sought from the applicant as to the source of the aforementioned material and to the approximate quantities to be imported.”</i></p>	<p>Suitable material won from the construction works in the eastern part of the site will be used to raise ground levels in the Western Field. Any additional fill required for the build-up will be imported engineering material such as Class 1A well graded granular material as defined in the National Roads Authority Specification for Roads and Bridges. The final surface layer will be a single size crushed rock fill. The source of the material will be local quarries, such as Roadstone in Ballygarvan and Finbarr O’Neill quarries at various locations.</p> <p>The expected quantity of engineering material to be imported for the Western Field will be approximately 4000m³.</p> <p>Topsoil will be stripped from the surface of the Western field, and stored for later use for landscaping purposes.</p>
	<p>Heritage (Ecologist)</p> <ul style="list-style-type: none"> • <i>“confirmation that appropriate material can be readily sourced for beach nourishment (EIA and possibly AA issue)”</i> 	<p>The stone on Gobby beach is a mix of the stone, arising from stone embedded in the glacial till cliffs. There are a number of sand and gravel quarries located in the glacio-fluvial gravel channel extending from west of Classes, to the west of Cork City, to east of Midleton. Material from any of the gravel quarries will be a suitable source for the beach sacrificial material.</p>

4. Conclusions

- The site geology is typical of the Ringaskiddy peninsula. The site is underlain by the Cuskinny Member, a Lower Carboniferous marine interbedded grey/brown sandstone, siltstone and mudstone. A fault running approximately WSW/ENE lies to the north of the site. Limestone bedrock is found to the north of the site.
- The pronounced steep slope on the development site is a man-made feature as evidenced by historic records on the OSi maps. The 1934 OSi map gives levels for the path which, when compared to the current site survey, clearly show the ground levels to have dropped (i.e. the ground has been excavated).
- The vulnerability rating of the groundwater on site is due to the shallow overburden rather than the site being underlain by limestone bedrock. There is no evidence of ingress of seawater on site.

Due consideration has been given to the geology of the site, including the structural geology of the regional faulting and folding. Due consideration has been given to the hydrogeology and hydrology of the site and its location on the shores of Cork Harbour. There are no discharges from site activities to ground or to the groundwater. Given the mitigation measures proposed to deal with the control and handling of all materials, the site, in terms of the soils, geology, hydrogeology and hydrology, will be minimally impacted by the development.

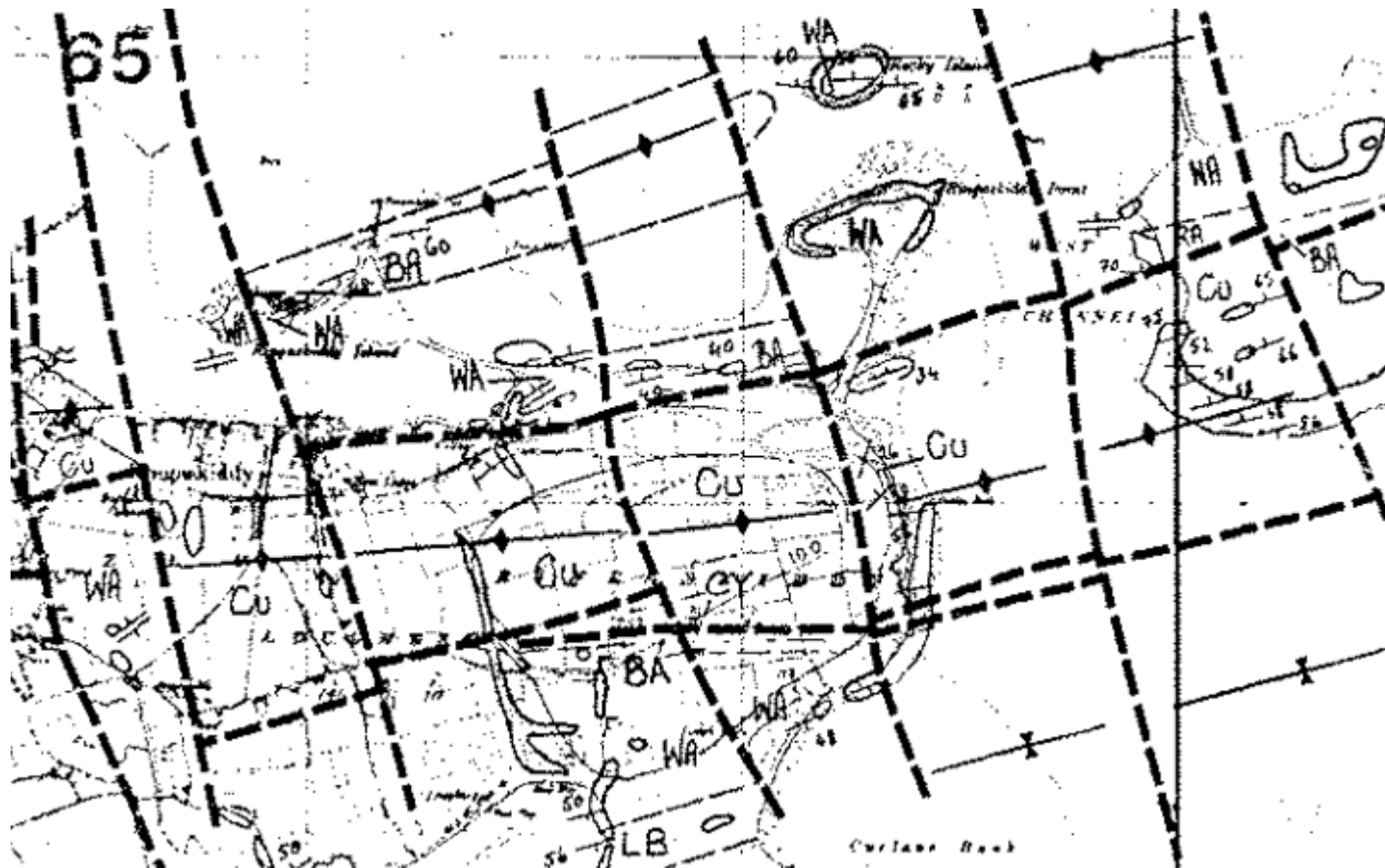


Figure 2: Sleeman 17/5 NW: Cork Harbour – Geological Survey of Ireland 1990



Figure 3a – Ground level changes on site since 1934

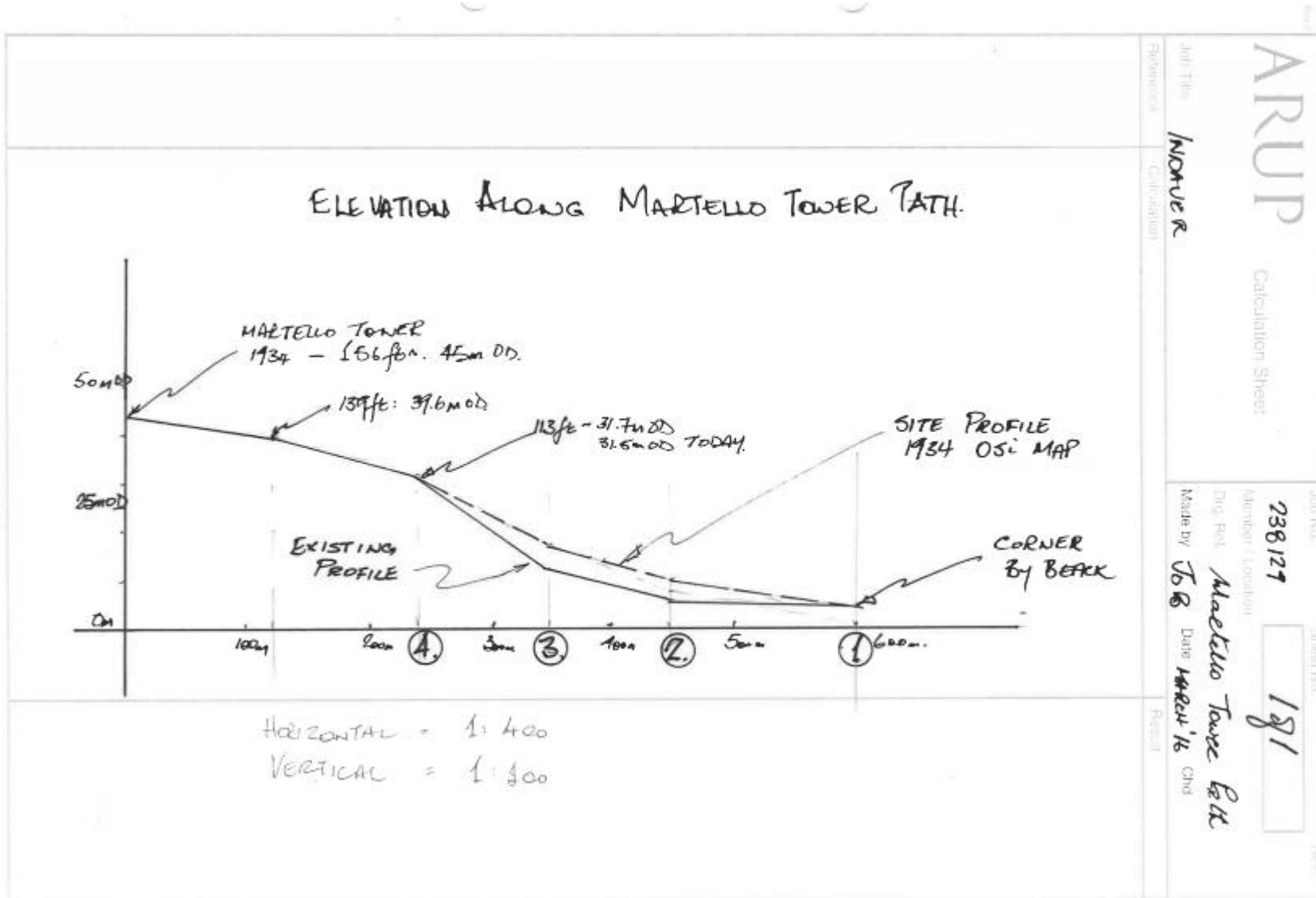


Figure 3b – Section Through existing and previous Martello Tower Path.