GLL PRS Holdco Limited

"Deer Park, Howth"
Large-scale Residential Development (LRD)
for lands adjoining Howth Demesne
Deer Park, Howth
Co. Dublin

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Document Control Sheet

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Document Title	EIAR Volume III Appendices			
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APPENDIX 1.1
CUMULATIVE PROJECTS LIST

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Cumulative Plans

Type	Location	Name	Spatial Overlap with Site	Status	Reference Link	Description
Statutory Plan	Fingal	Fingal County Development Plan 2023–2029	Yes	In Force	https://www.fingal.ie/development-plan	Relevant Local Authority Development Plan
Statutory Plan	Eastern and Midland Region	Eastern and Midland Regional Assembly Regional and Spatial Economic Strategy	Yes	In Force	https://emra.ie/rses/	Relevant Regional RSES
Statutory Plan	Ireland	National planning Framework	Yes	In Force	https://www.npf.ie/project-ireland-2040-national-planning-framework/	National Planning Framework
Plan	Greater Dublin Area	Greater Dublin Area Transport Strategy	Yes	In Force	https://www.nationaltransport.ie/planning-and-investment/strategic-planning/greater-dublin-area-transport-strategy/	Relevant MASP Transport Strategy
Plan	Fingal	Fingal Climate Change Action Plan 2019-2024	Yes	In Force	https://www.fingal.ie/climate-change-action-plan-2019-2024	Relevant Local Authority CAP
Plan	Fingal	Fingal Climate Action Plan 2024-2029	Yes	Draft	https://consult.fingal.ie/en/consultation/fingal-county-council-draft-climate-action-plan-2024-2029	Draft Local Authority CAP
Plan	Fingal	Fingal Biodiversity Action Plan 2023-2030	Yes	In Force	https://www.fingal.ie/sites/default/files/2023-12/Fingal%20Biodiversity%20Action%20Plan%202023-2030.pdf	Relevant Local Authority Biodiversity Action Plan
Plan	Fingal	Fingal Heritage Plan 2024-2030	Yes	In Force	https://www.fingal.ie/FingalHeritagePlan2024-2030	Relevant Local Authority Heritage Plan
Plan	Fingal	Fingal Local Economic and Community Plan 2023-2028	Yes	In Force	https://www.fingal.ie/council/service/local-economic-and-community-plan-lecp	Relevant Local Authority LECP
Plan	Ireland	Climate Action Plan 2024	Yes	In Force	https://www.gov.ie/en/publication/67104-climate-action-plan/	Current National CAP
Plan	Ireland	4th National Biodiversity Action Plan 2023–2030	Yes	In Force	https://www.gov.ie/en/publication/93973-irelands-4th-national-biodiversity-action-plan-20232030/	Current National Biodiversity Action Plan
WFD	Ireland	River Basin Management Plan for Ireland 2018-2021	Yes	In Force	https://www.gov.ie/en/publication/429a79-river-basin-management-plan-2018-2021/	The Plan sets out the actions that Ireland will take to improve water quality and achieve 'good' ecological status in water bodies by 2027, as under the Water Framework Directive (WFD)

Cumulative Projects

Reg. No.	Appeal Reg. No.	Description of Development	Application Type	Decision	Decision Date	Links	Links2	Notes
N/A		DART+ Coastal North – Rail improvement project including (a) extension of the existing electrified rail network to Drogheda MacBride station, and (b) an increase to the rail capacity on the Northern Line between Dublin City Centre and Drogheda MacBride Station, including the Howth Branch.	Railway Order	N/A	N/A	https://www.dartplus.ie/en-ie/projects/dart-north		RO to be lodged 2024.
F23A/0512		Improvements to GAA Club at Balkill Road, Howth, including: A single storey 159sq.m extension to the existing Beann Eadair club house, new external seating, 5m hurling wall enclosure with artificial grass surface, new 190sq.m single-storey changing room building, and a non-potable fresh water well for pitch irrigation and grey water use	Permission	Additional Information	N/A	https://planning.agileapplications.ie/fingal/application-details/95867		Time extension on AI granted 04/03/2024
F23A/0286		Retention permisson for a 36.8m telecommunications support structure carrying antenna and dishes, communications building and associated site works at Ben of Howth	Retention	Grant	25/01/2024	https://planning.agileapplications.ie/fingal/application-details/95153		
F22A/0372	ABP-317883-23	Replacement of the existing "Deer Park Hotel" building (and all associated structures) with a new 142-bed hotel, including: a bar, restaurant, gym/spa facility, swimming pool, retail, meeting rooms, bar and function area, external dining areas, photovoltaic panels, ESB substation, 170-space car park, and a new vehicular access.	Permission	Grant - Appeal Pending	31/07/2023	https://planning.agileapplications.ie/fingal/application-details/92819	https://www.pleanala.ie/en-ie/case/317883	AI received 6/6/2023 - Application under appeal, decision was due 08/01/2024
F22A/0558		Claremont Industrial Estate, West Pier, Howth – two storey building (1293 sq.m.) for the processing, storage, and distribution of food. Also includes a 74.17 sq.m factory retail outlet for sale to the public and ancillary office and welfare facilities.	Permission	Grant	10/08/2023	https://planning.agileapplications.ie/fingal/application-details/93479		
ABP-313133-22		Bailey Court - Balscadden Road, Howth (Balscadden SHD) – Demolition of existing structures on site, construction of 180 no. apartments and associated site works.	Strategic Housing Development	Grant (Conditional)	30/03/2023	https://www.pleanala.ie/en-ie/case/313133		No significant changes from ABP. No JR.

F22A/0477	ABP-316294-23	Residential scheme (36 no. units – 14 no. 1 bed, 22 no. 2 bed) at 60 Main Street, Howth, Co. Dublin, D13 N8K3	Permission	Grant - Appeal Pending	22/03/2023	https://planning.agileapplications.ie/fingal/application-details/93190	https://www.pleanala.ie/en-ie/case/316294	AI Received 24/02/2023 Application under appeal, decision was due 21/08/2023
F22A/0046	ABP-316113-23	Refurbishment/redevelopment/change of use for part of the existing Howth Castle buildings, Stable Block and Attendant landsincluding the demolition of some farm buildings, the refurbishment and construction of new buildings, and a change of use of part of the lower and upper ground floors of the castle and adjoining stable block and stable yard from primarily residential use to hospitality and tourist retail use.	Permission	Grant - Appeal Pending	23/02/2023	https://planning.agileapplications.ie/fingal/application-details/91537	https://www.pleanala.ie/en-ie/case/316113	AI received 21/12/22 Application under appeal, decision was due 25/07/2023
F21A/0386	ABP-311476-21	Graymount, Dungriffin Road, Howth – Demolition of buildings, construction of a 2-4 storey apartment block comprising 32 apartments and all ancillary works.	Permission	Grant (Conditional) on Appeal (3rd Party)	21/10/2022	https://planning.agileapplications.ie/fingal/application-details/90320	https://www.pleanala.ie/en-ie/case/311476	No significant changes on appeal.
ABP-306872-20		Santa Sabina - Greenfield Road, Sutton (Seafield SHD) – Alterations to a previously permitted development of 96 no. units under (Reg, Ref: F17A/0615) to provide 143 no. apartments. The total number of additional/altered residential units subject to this application is 102 no. units with all associated site works.	Strategic Housing Development	Grant (Conditional)	24/08/2020	https://www.pleanala.ie/en-ie/case/306872		No JR.
ABP-306102-19		Former Techrete Site, Howth Road (Claremont SHD) – emolition of existing industrial/commercial buildings (c8,162 sq.m GFA) at Howth Road, and the construction of a mixed-use development including 512 no. apartments (4 no. studio, 222 no. 1-bed, 276 no. 2-bed, 10 no. 3-bed), childcare facility and associated site works.	Strategic Housing Development	Grant (Conditional)	03/04/2020	https://www.pleanala.ie/en-ie/case/306102		No significant changes from ABP. JR Refused ([2020] IEHC 529)
F17A/0615	ABP-301643-18	Greenfield Road, Sutton – Residential development for 96 no. units comprising 86 no. apartment units (71 no. 2-bed, 15 no. 1-bed) in 4 no. 3-storey blocks, 10 no. semi-detached houses (8 no. 5-bed, 1 no. 4-bed, 1 no. 3-bed). Includes crèche, site access, new access to the school, 165 car parking spaces	Permission	Grant	26/10/2018	https://planning.agileapplications.ie/fingal/application-details/78337	https://www.pleanala.ie/en-ie/case/301643	Appeal Withdrawn

APPENDIX 5.1
VISUAL ASSESSMENT

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Appendix 5. 1

Visual Assessment – Views of the Site

Plate 1 : View looking north-east from the south-west of the site

Plate 2 : View looking north-west from the south-east of the site

Plate 3 : View looking west along the southern boundary of the site

Plate 4 : View looking east along the southern boundary of the site

Plate 5 : View looking east, north-east through the proposed development site

Plate 6 : View looking north-west along the western boundary of the site

Plate 7 : View looking south-west towards the concrete blockwork wall and property on the western side of the site

Plate 8 : View looking north-west towards the concrete blockwork wall and property on the western side of the site

Plate 9 : View looking south-west along the western boundary of the site

Plate 10 : View looking the north-western corner of the site

Plate 11 : View looking east along the northern stone wall boundary of the site

Plate 12 : View looking south-east along the northern stone wall boundary of the site

Plate 13 : View looking north-west towards a section of the northern and north-western boundaries of the proposed development site

Plate 14 : View looking east towards the eastern boundary of the site

Plate 15 : View of a section of the curved stone boundary wall at the north-eastern corner of the site

Plate 16 : View looking north along the boundary wall to the east and north-east of the proposed development site

Plate 17 : View looking south from the south eastern boundary of woodland edge looking through to the golf course

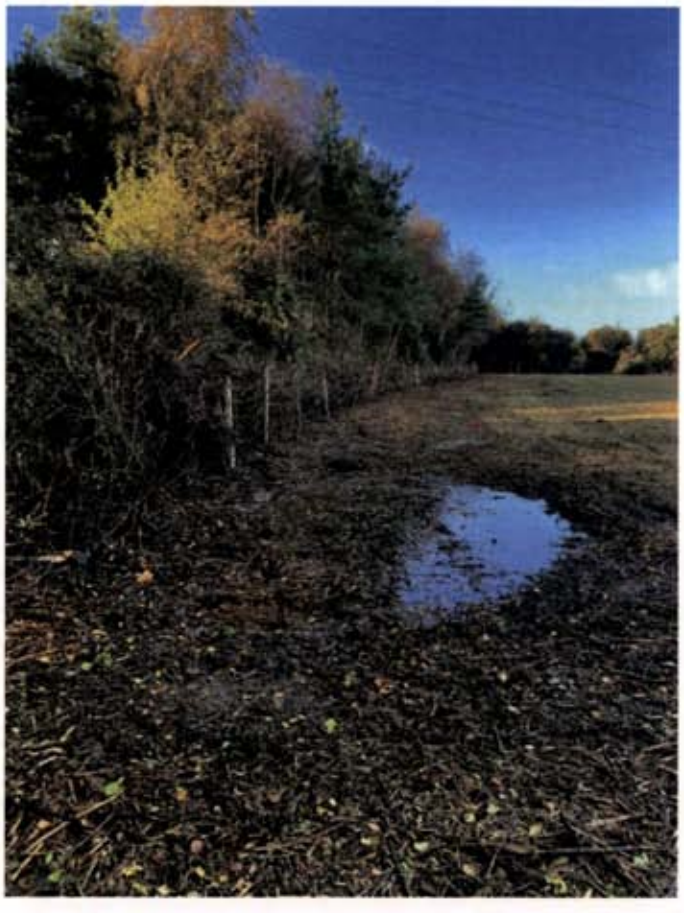

Plate 18 : View looking north along the eastern boundary of the site

Plate 19 : View looking north along a section of concrete blockwork wall and old agricultural gate access to the south of the site.

Plate 20 : View looking south and east through the proposed development site

Plate 21 : View looking north-east from the north of the proposed development site towards the Irish Sea, Irelands Eye and Lambay Island

Plate 21 : View looking east, south-east from the north of the proposed development site towards the concrete blockwork boundary wall and properties to the west of the site.

Plate 22 : View looking east at the informal entrance through a gap in the hedgerow/woodland edge along the south-eastern edge of the site

Plate 23 : View looking north-west along part of the boundary along lands and properties to the east of the site

Plate 24 : View looking east towards the informal access to the proposed development site, from the field to the south-west of the site. Construction cranes are visible in the background of view in the Claremont site on Howth Road.

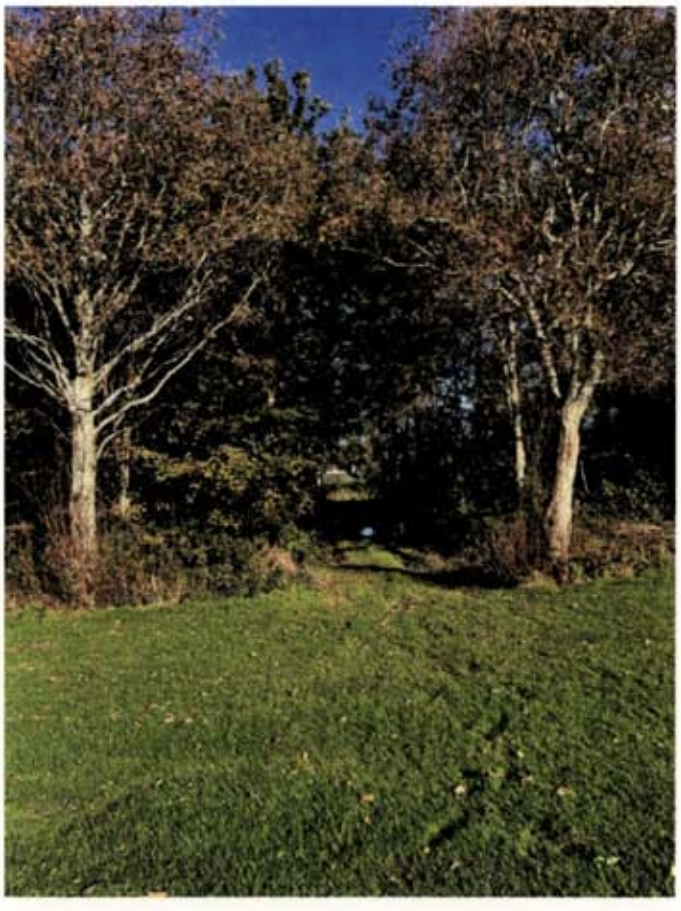

Plate 25 : View looking north from the gold course south of the site, towards the informal entrance through the woodland edge to the field to the south-west of the site

Plate 26 : View looking north-east from the golf course south of the site. Construction cranes are visible on the Claremont site on Howth Road

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Plate 28 : View looking south-west towards the proposed development site from Howth Road (at entrance to Howth Castle)

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Plate 31: View looking south-east from Howth Road towards the proposed development site

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Plate 33 : View looking east towards the entrance to Howth Castle from Howth Road

Plate 34 : View looking east along the northern boundary of the site on Howth Road

Plate 35 : View looking north towards the construction site at the Claremont development on Howth Road

Plate 36 : View looking north, north-west towards the construction site at the Claremont development on Howth Road

Plate 37 : View looking west towards the eastern boundary of the site from the entrance to Howth Castle

Plate 38 : View looking south at the entrance into the grounds of Howth Castle

Plate 39 : View looking southwest from the entrance gates towards the northeastern boundary of the site

APPENDIX 5.2
PHOTOMONTAGES

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MAY 2024

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Deer Park Howth LRD

Verified Views and CGI

Applicant: GLL PRS Holdco. Limited

May 2024

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Presentation 1
	Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com	

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Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: CGI 1
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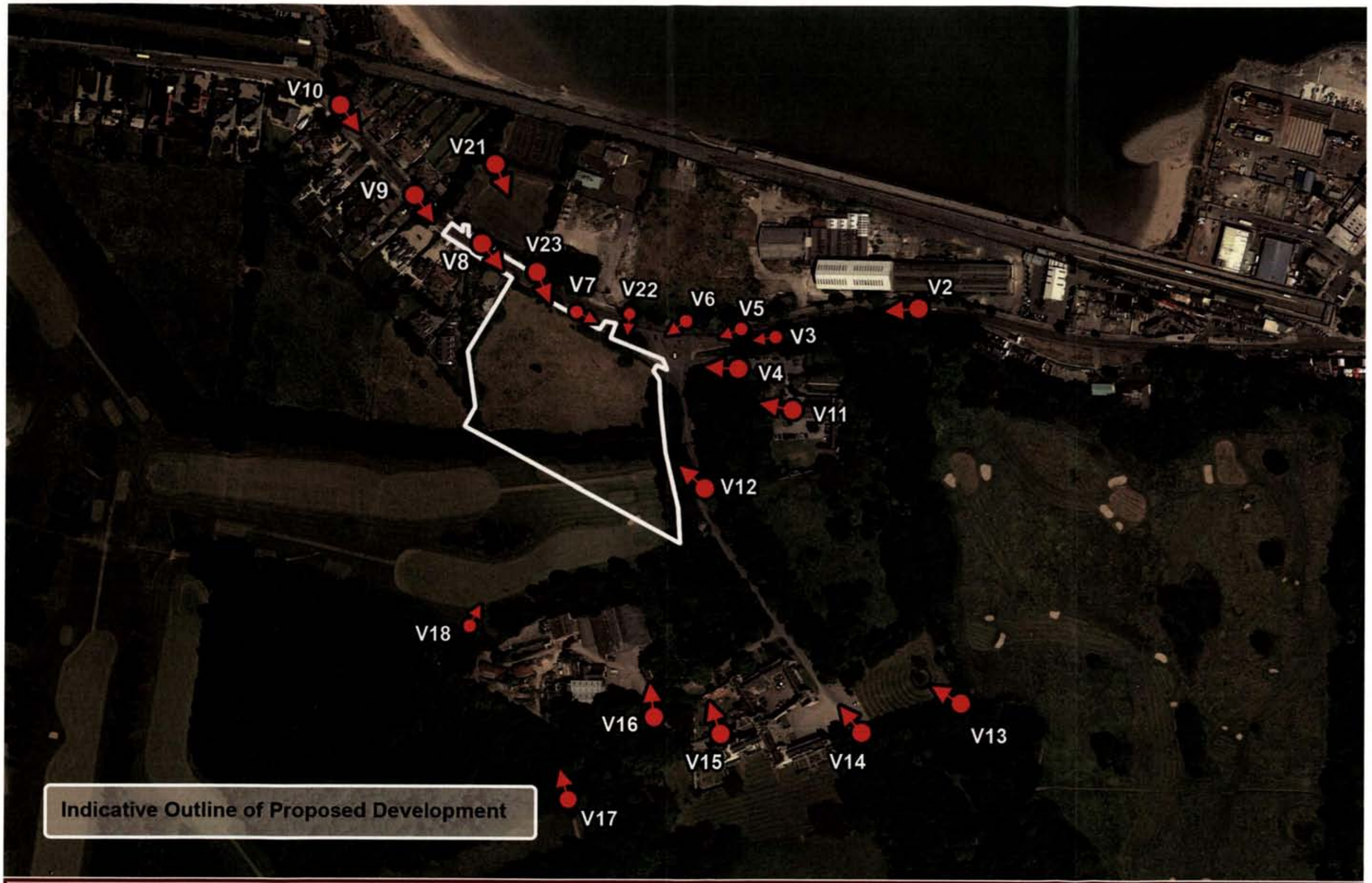

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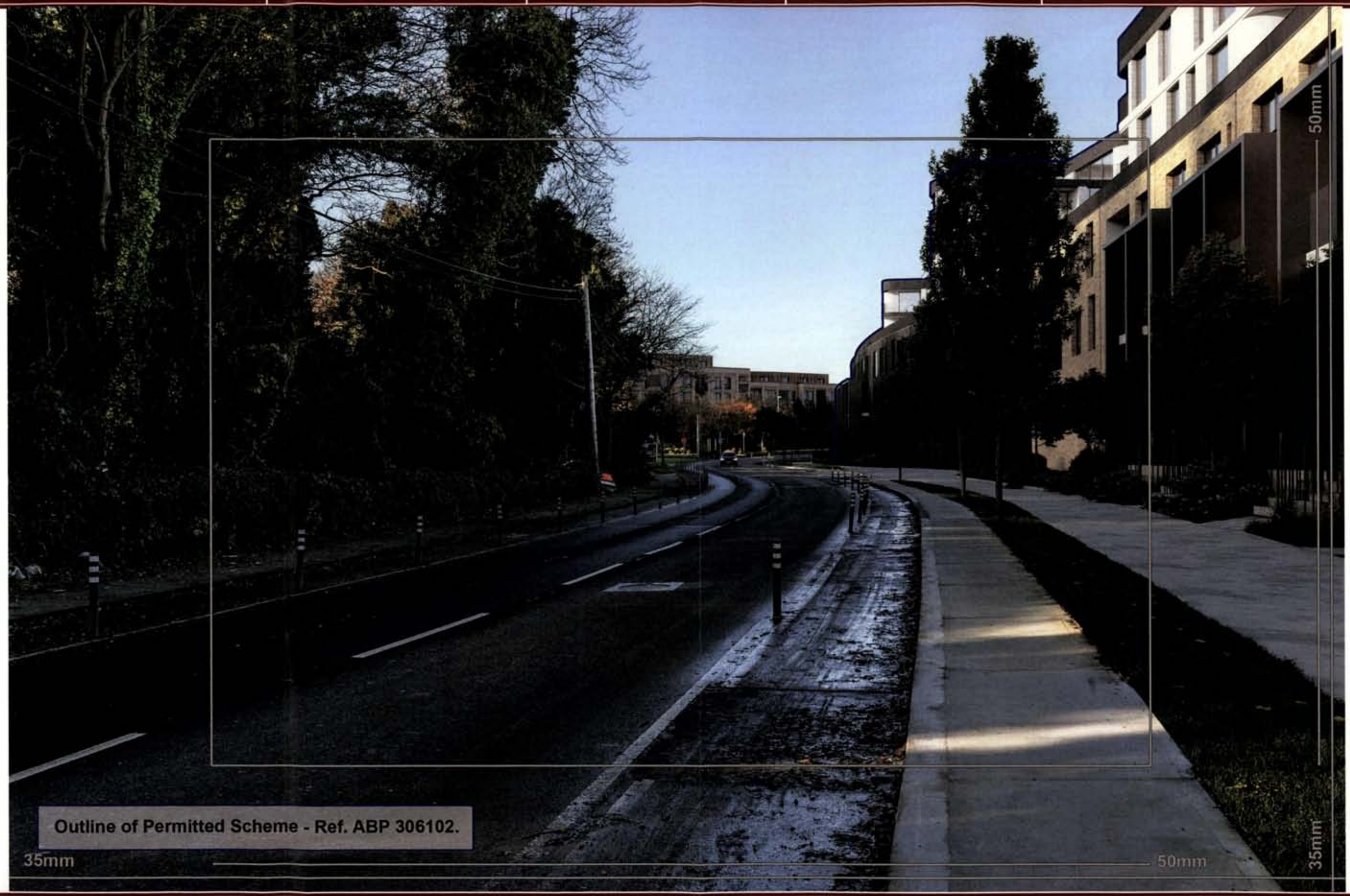

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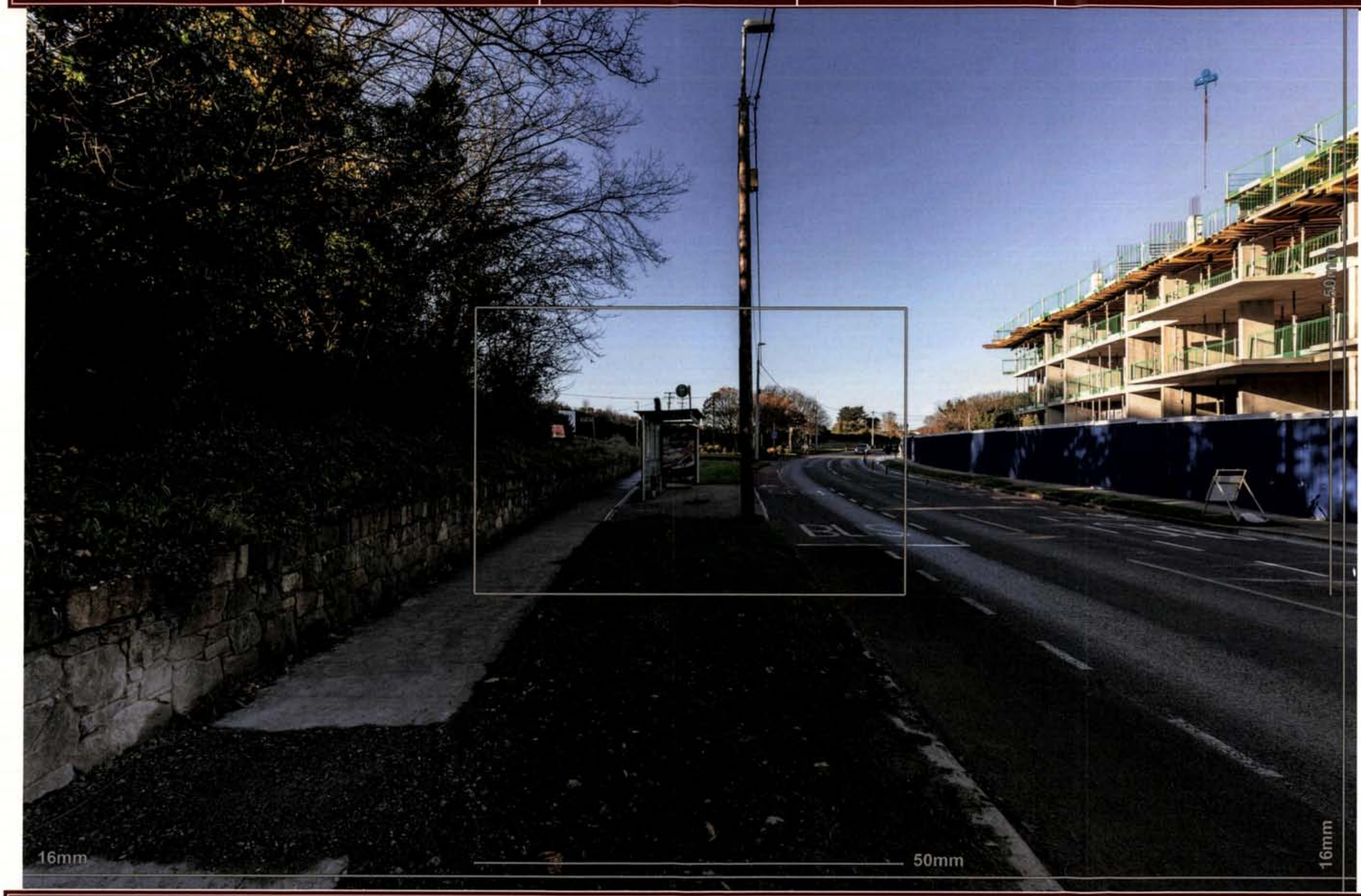

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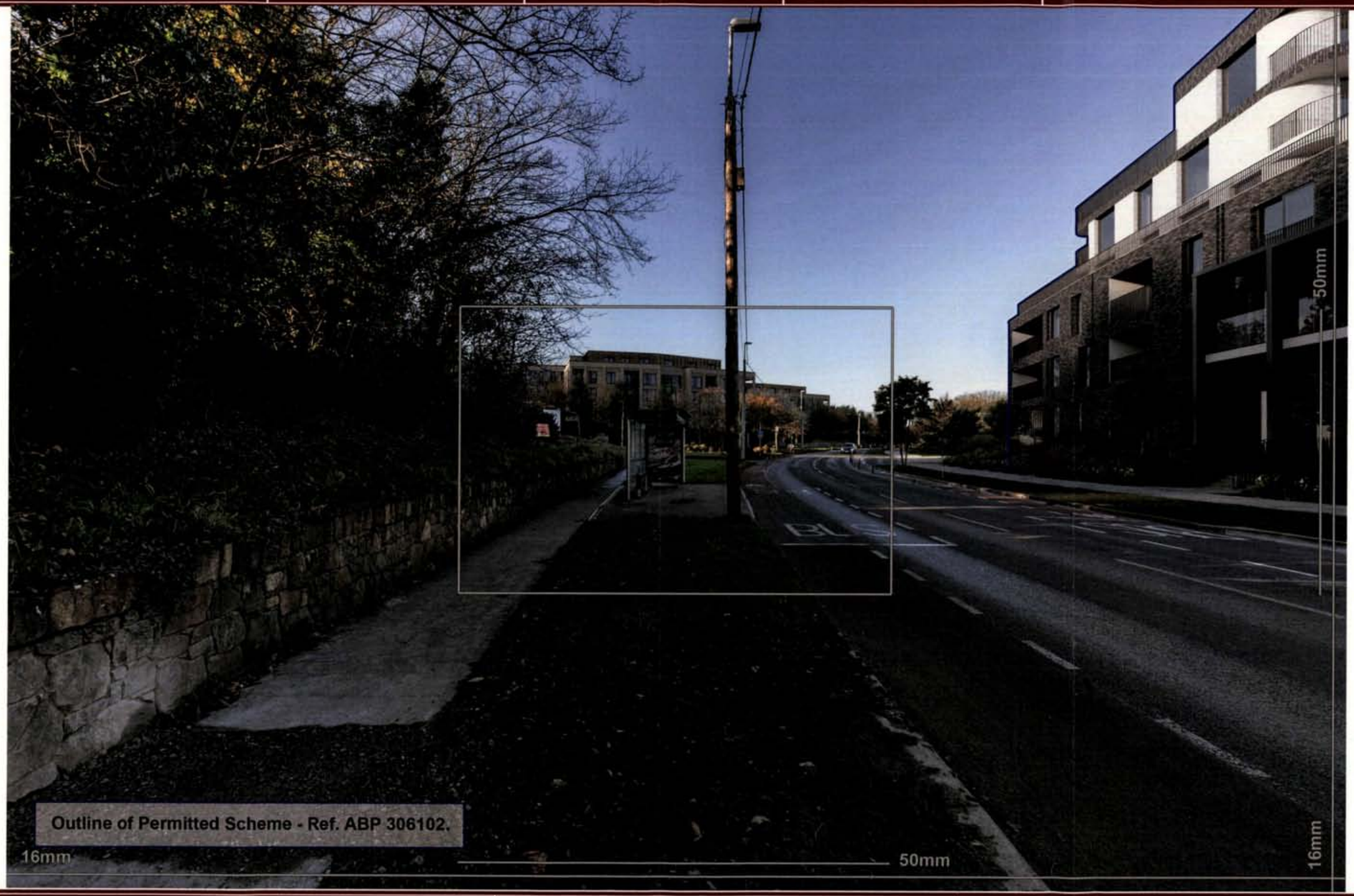

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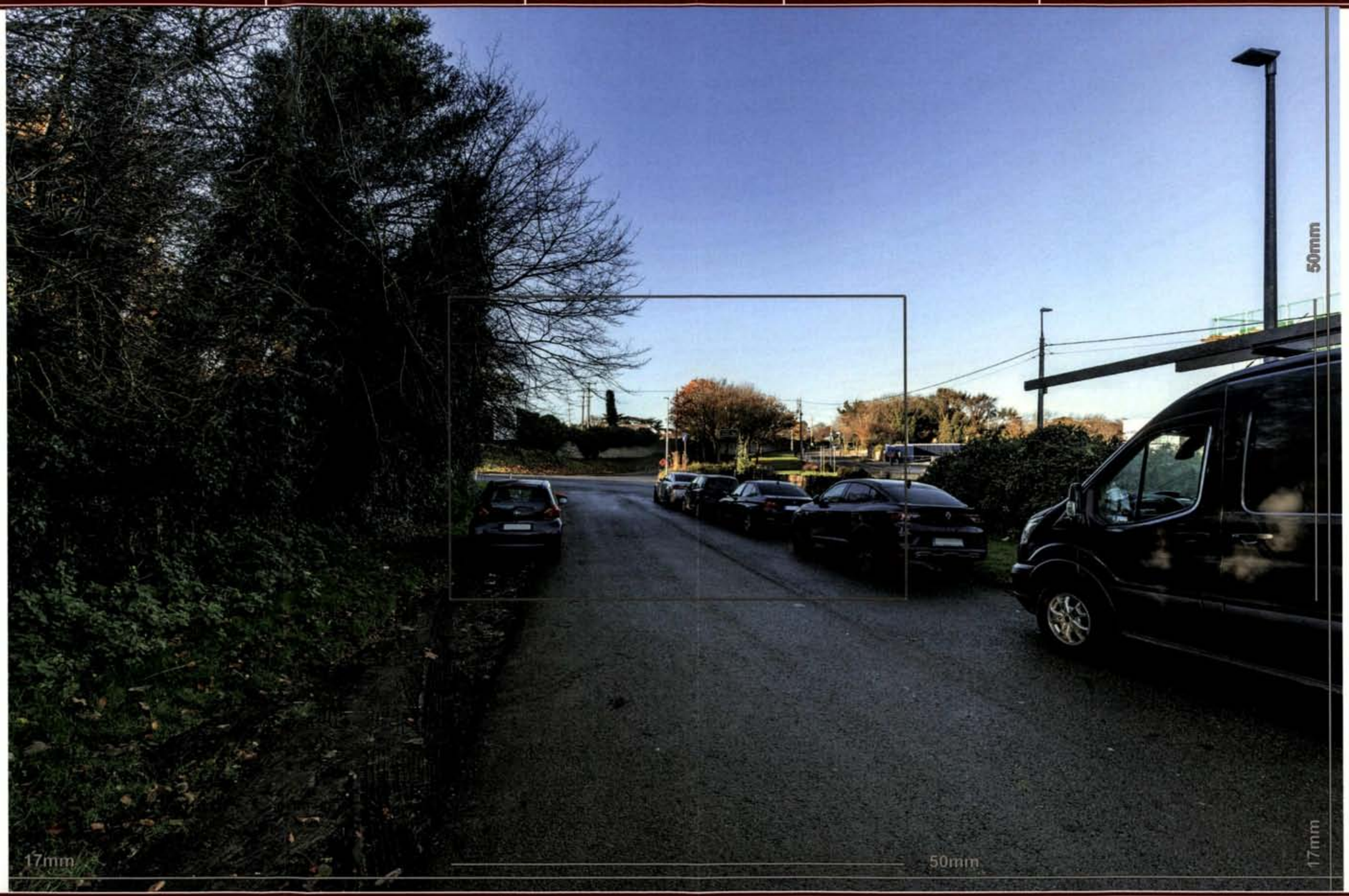

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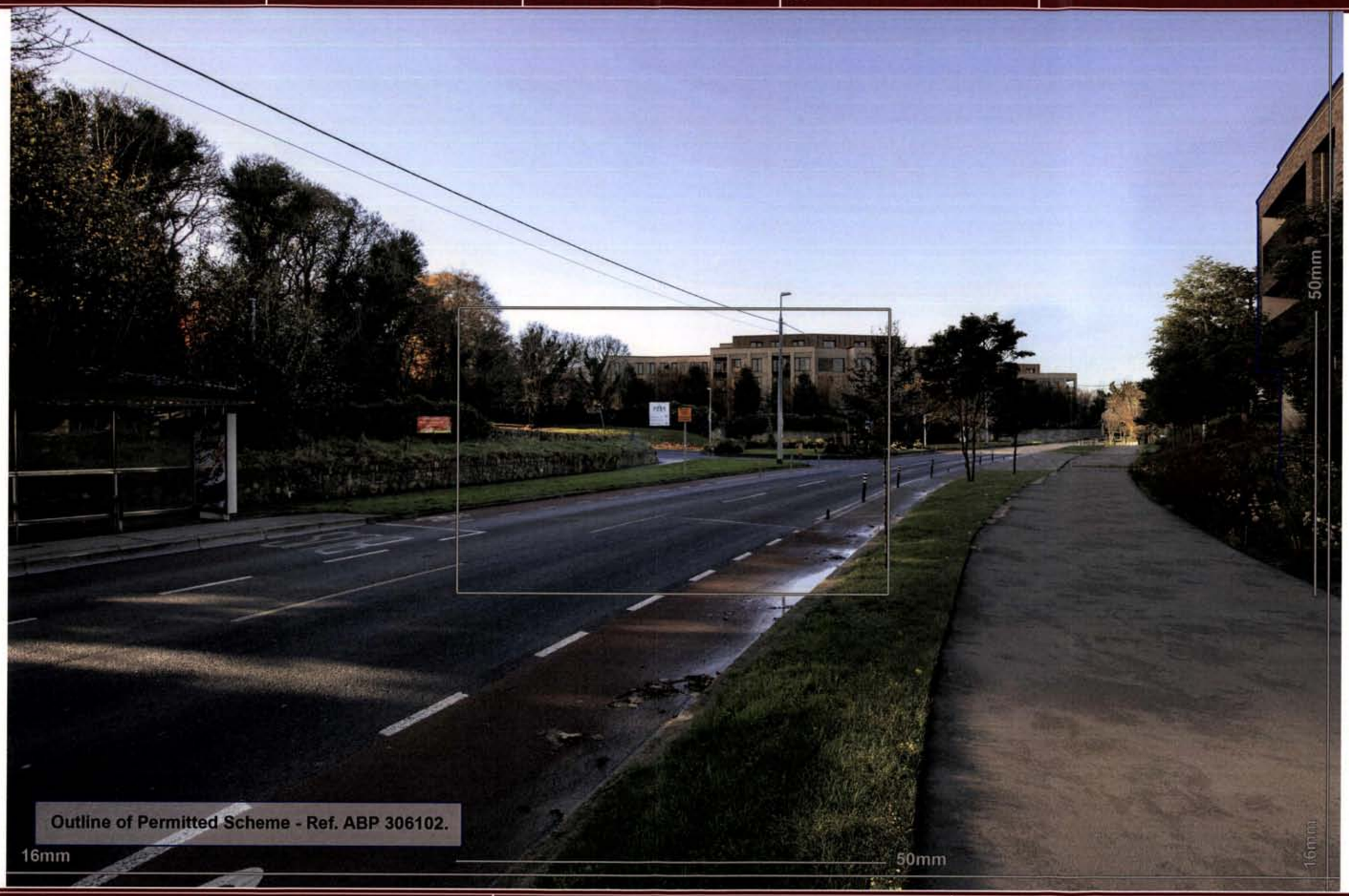

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Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 6
	Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com	

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 42.17m	Date & Time: 15/11/202310:28:06

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 6
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 5.63m	Date & Time: 08/11/202314:51:43

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 7
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0185 www.3ddesignbureau.com info@3ddesignbureau.com

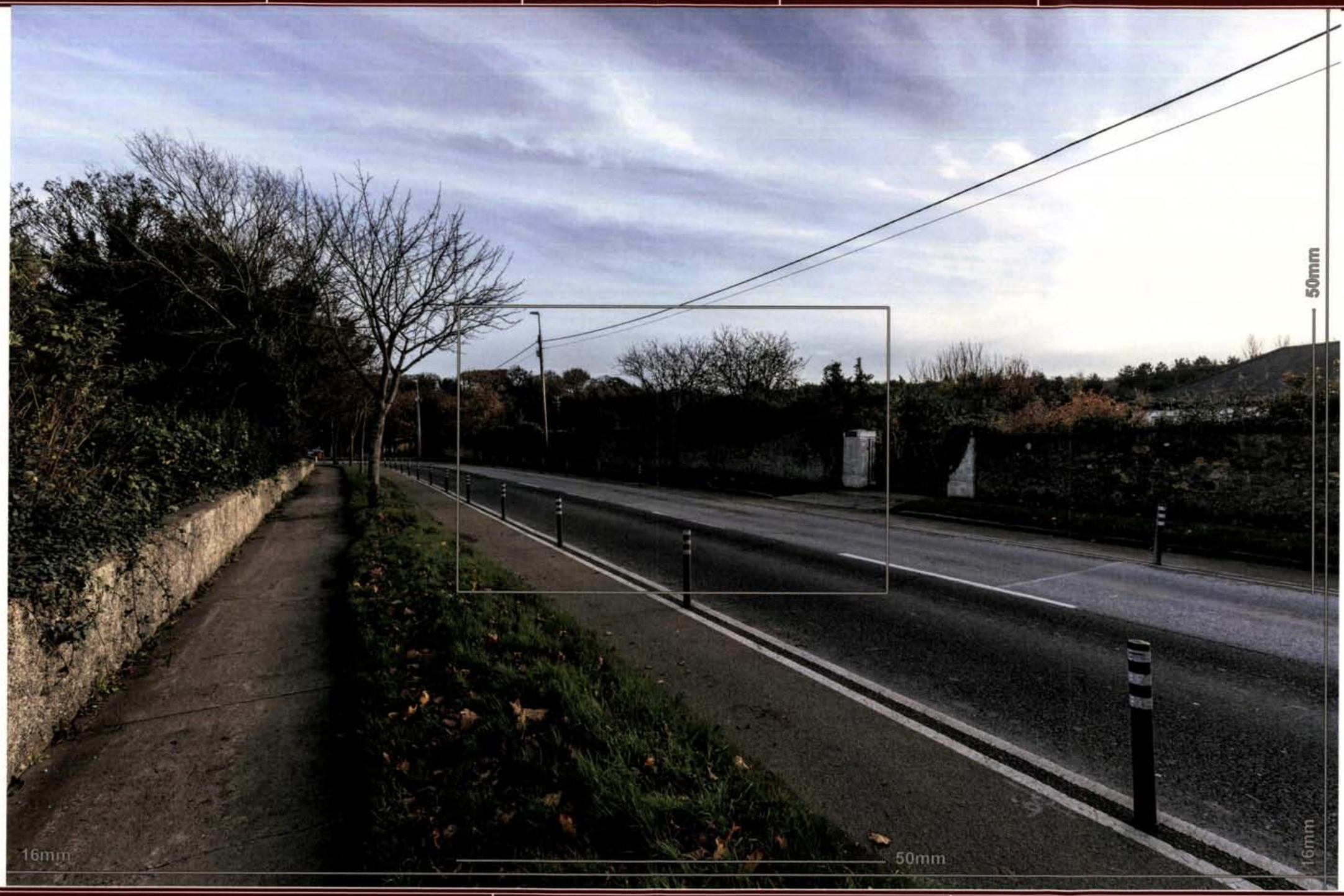
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 5.63m	Date & Time: 08/11/202314:51:43

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 7
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 5.63m	Date & Time: 08/11/202314:51:43

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 7
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 23.36m	Date & Time: 08/11/202314:46:48



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 8
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 23.36m	Date & Time: 08/11/202314:46:48

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 8
	Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com	

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 23.36m	Date & Time: 08/11/202314:46:48

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 8
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0180 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 35mm	Approx Dist: 93.32m	Date & Time: 08/11/202314:42:20

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 9
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0188 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 35mm	Approx Dist: 93.32m	Date & Time: 08/11/202314:42:20

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 9
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

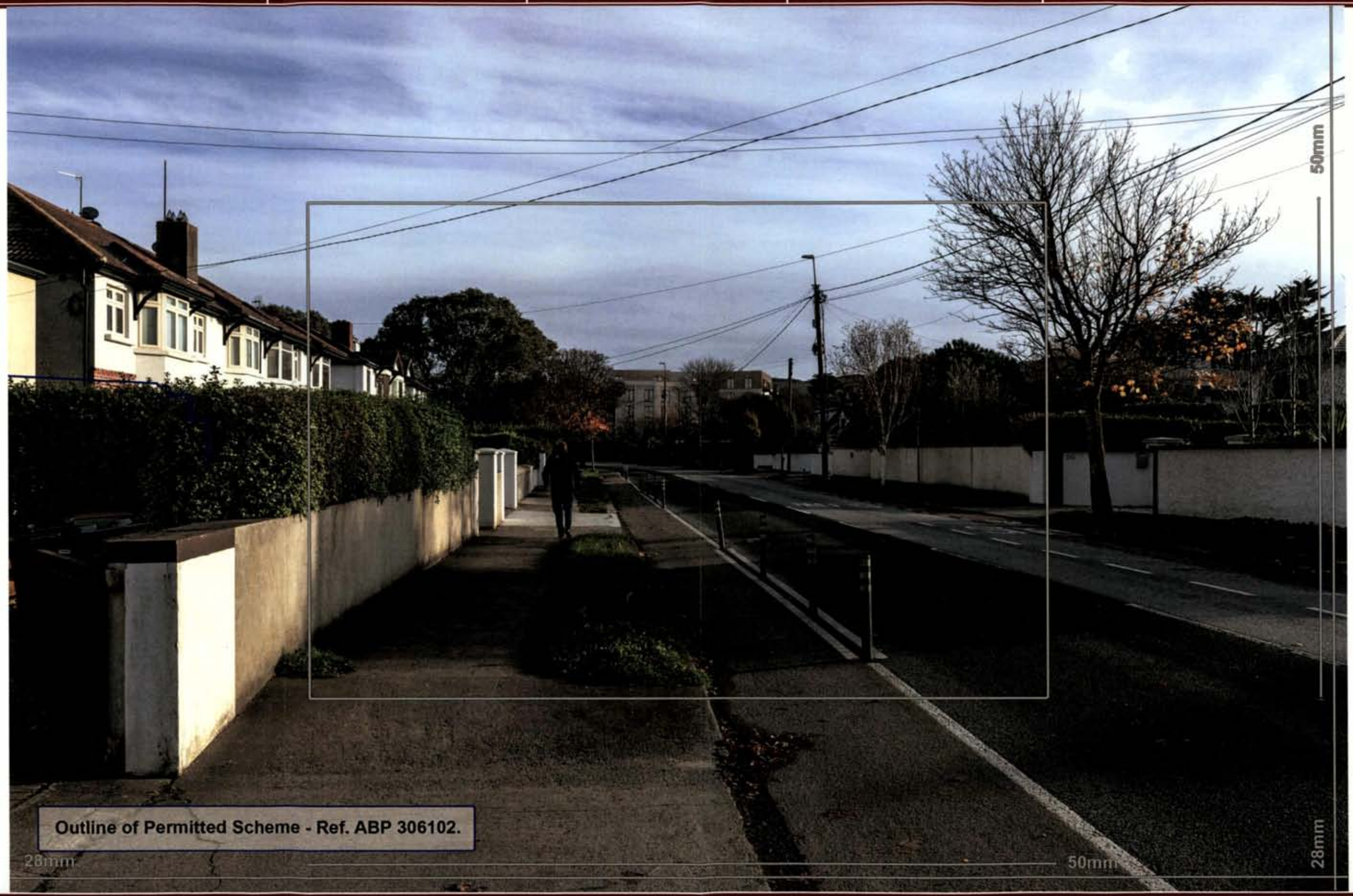
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 28mm	Approx Dist: 166.15m	Date & Time: 08/11/202314:36:52

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 10
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 28mm	Approx Dist: 166.15m	Date & Time: 08/11/202314:36:52

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 10
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 28mm	Approx Dist: 166.15m	Date & Time: 08/11/202314:36:52



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 10
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0180 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 110.00m	Date & Time: 15/11/202310:58:19

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 11
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 110.00m	Date & Time: 15/11/202310:58:19

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 11
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 110.00m	Date & Time: 15/11/202310:58:19

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 11
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 35.35m	Date & Time: 08/11/202312:52:04

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 12
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

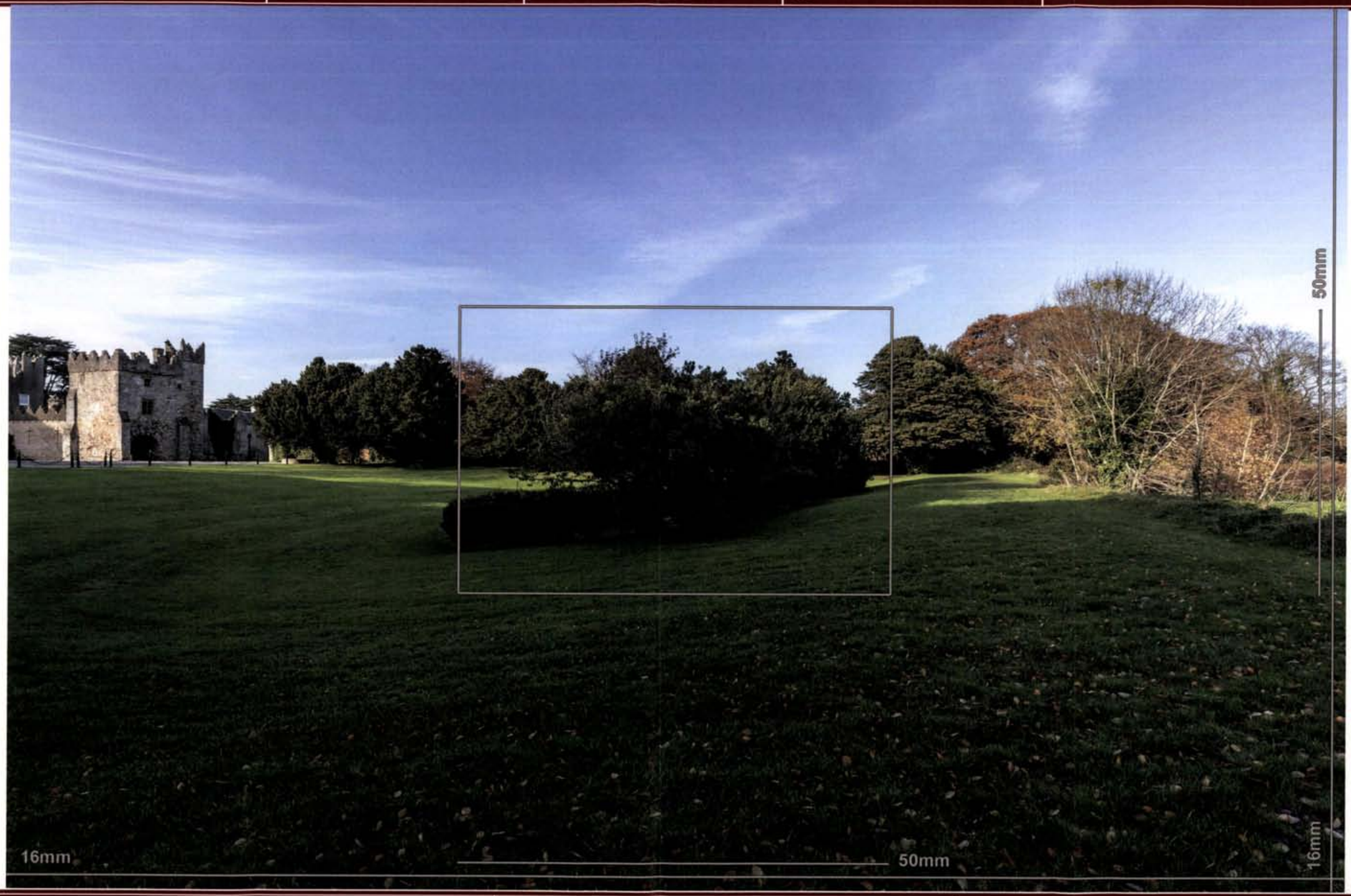
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 35.35m	Date & Time: 08/11/202312:52:04

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 12
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 35.35m	Date & Time: 08/11/202312:52:04

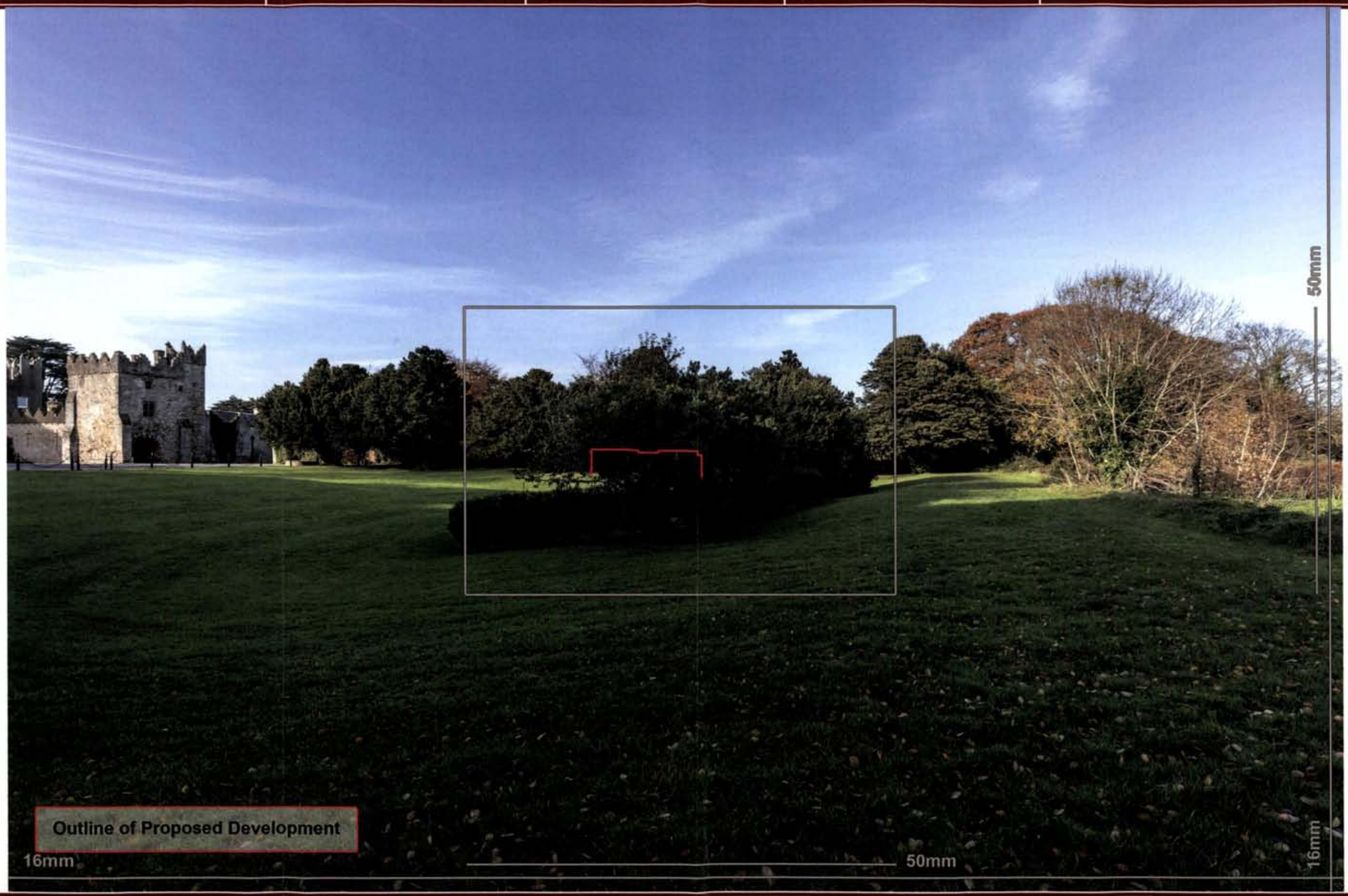
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 12
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 240.47m	Date & Time: 08/11/202312:58:40



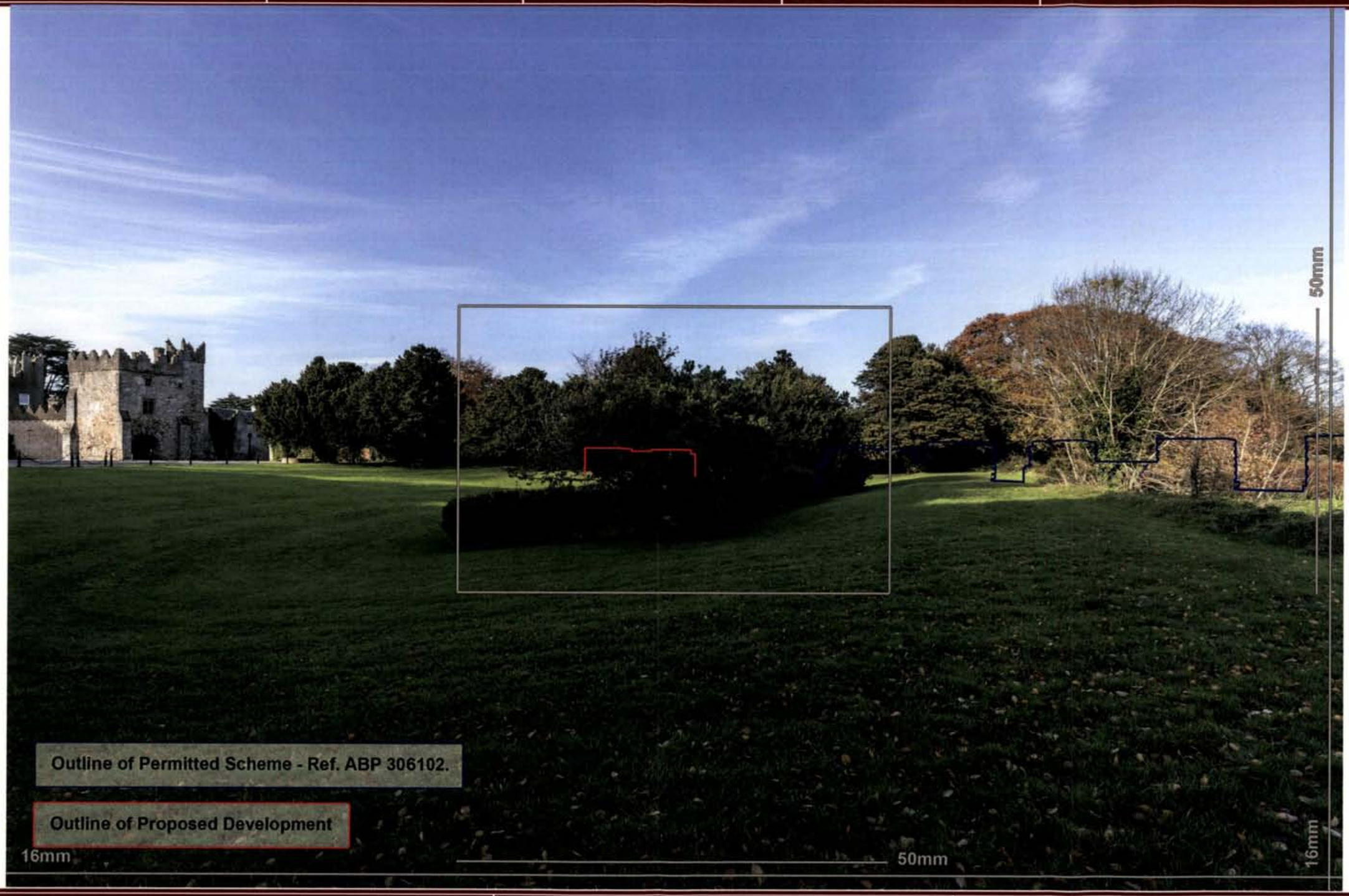
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 13
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 240.47m	Date & Time: 08/11/202312:58:40



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 13
	Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com	

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 240.47m	Date & Time: 08/11/202312:58:40

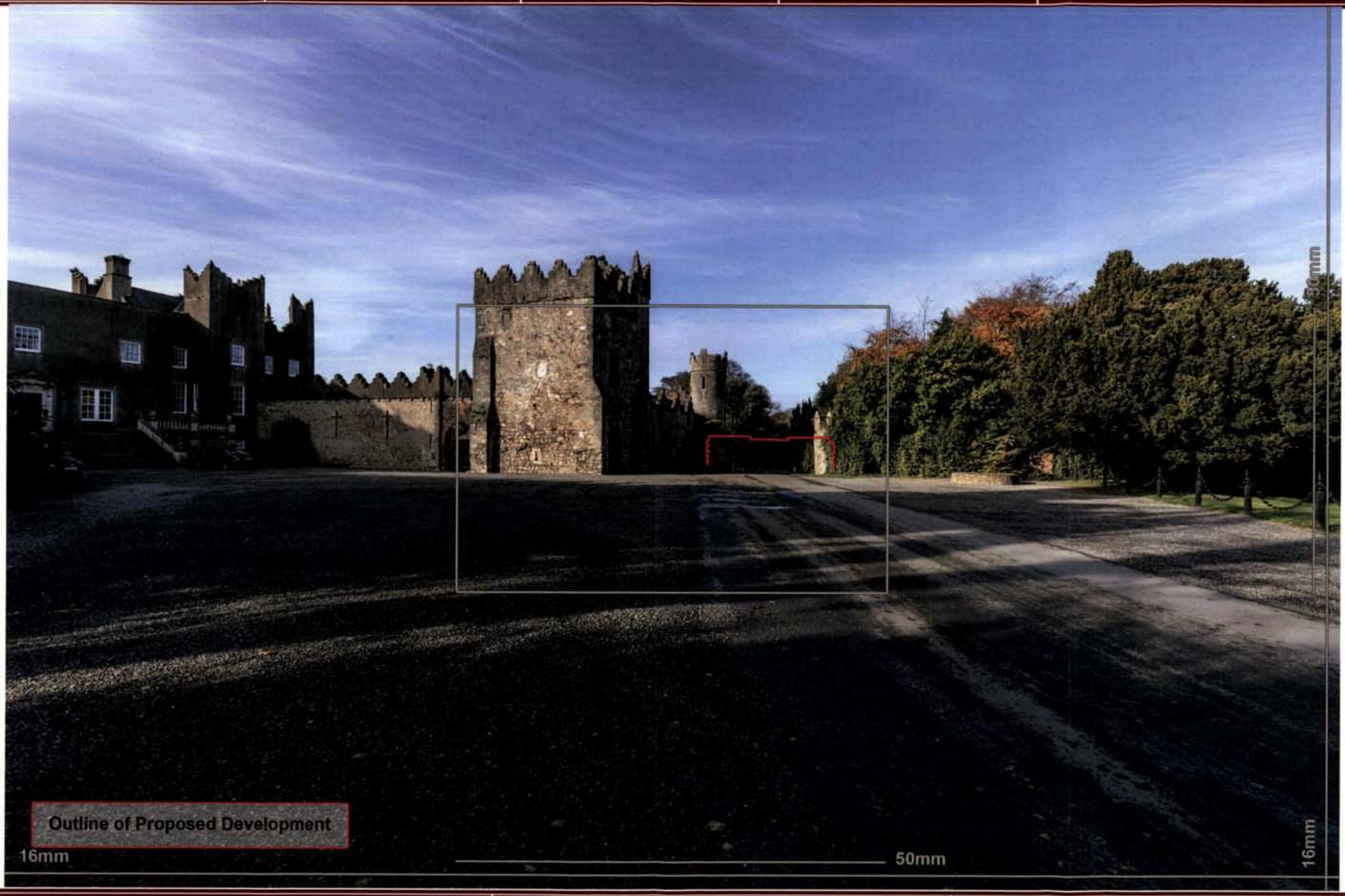


Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 13
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 194.1m	Date & Time: 08/11/202313:06:01

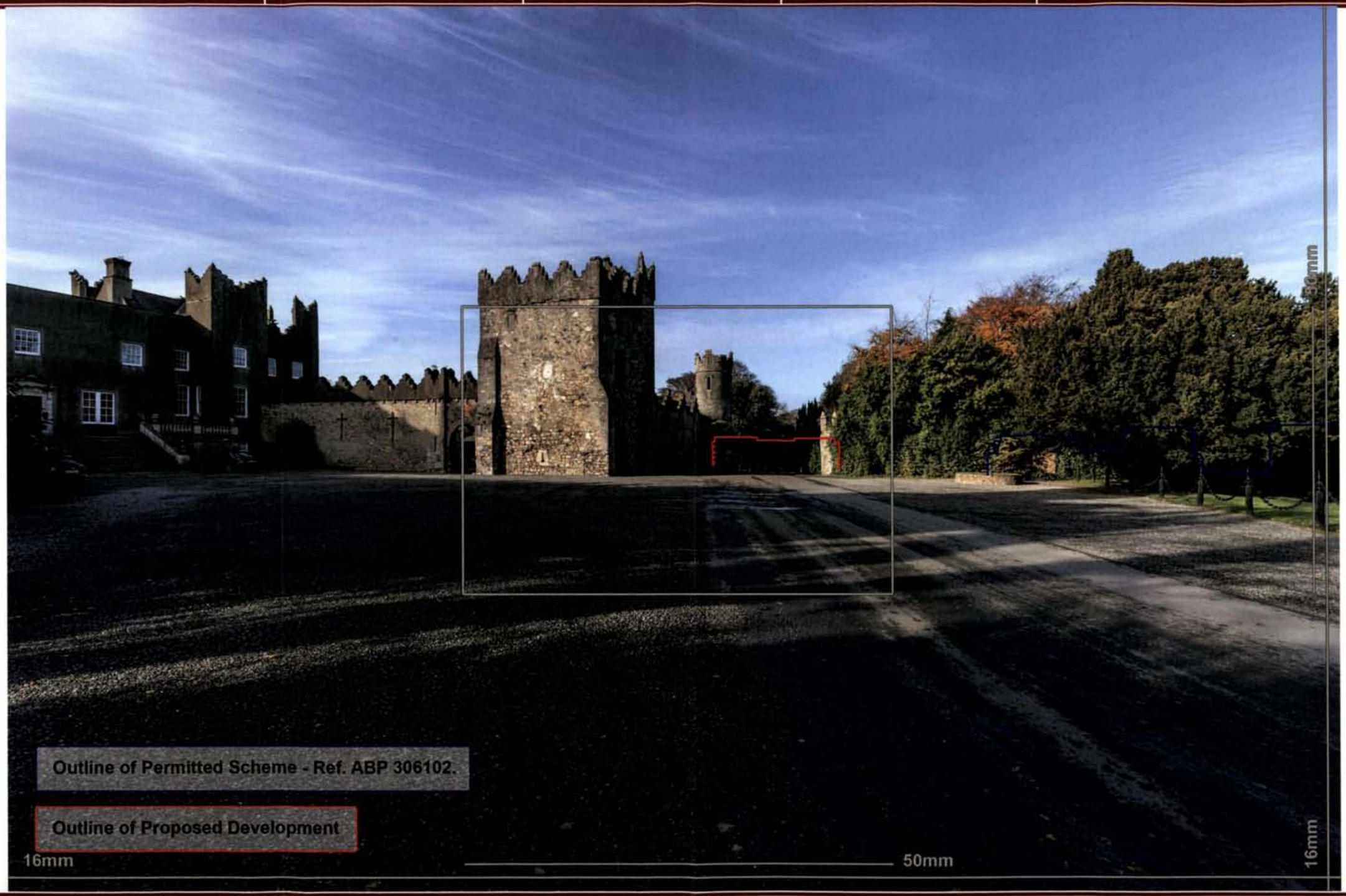
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 14
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 194.1m	Date & Time: 08/11/202313:06:01



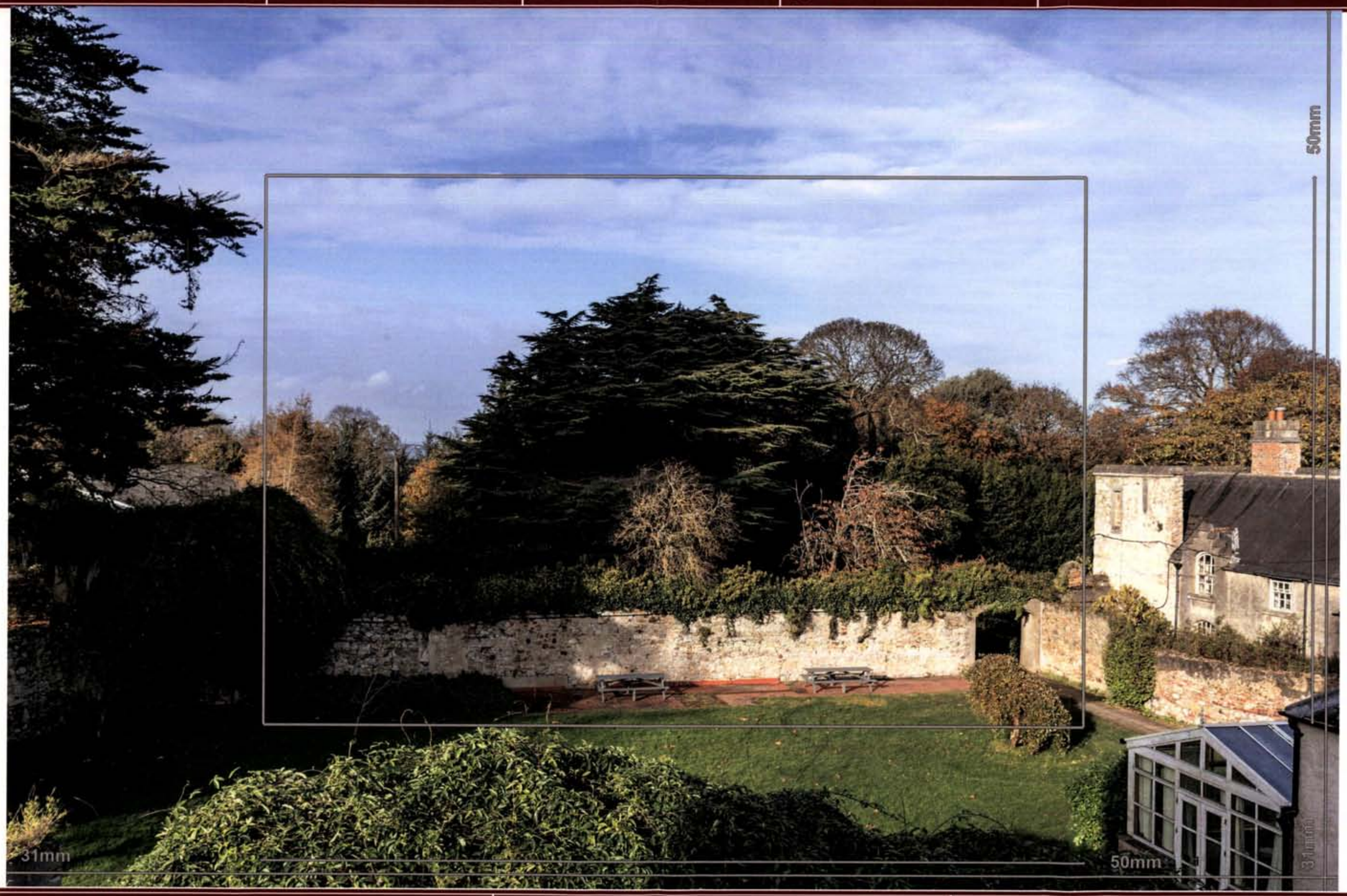
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 14
	Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com	

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 194.1m	Date & Time: 08/11/202313:06:01



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 14
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0180 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 31mm	Approx Dist: 135m	Date & Time: 08/11/202313:21:06



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 15
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 31mm	Approx Dist: 135m	Date & Time: 08/11/202313:21:06

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 15
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 31mm	Approx Dist: 135m	Date & Time: 08/11/202313:21:06

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 15
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 124.96m	Date & Time: 08/11/202313:28:54

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 16
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 124.96m	Date & Time: 08/11/202313:28:54

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 16
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 124.96m	Date & Time: 08/11/202313:28:54

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 16
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 178m	Date & Time: 08/11/202313:35:04

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 17
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

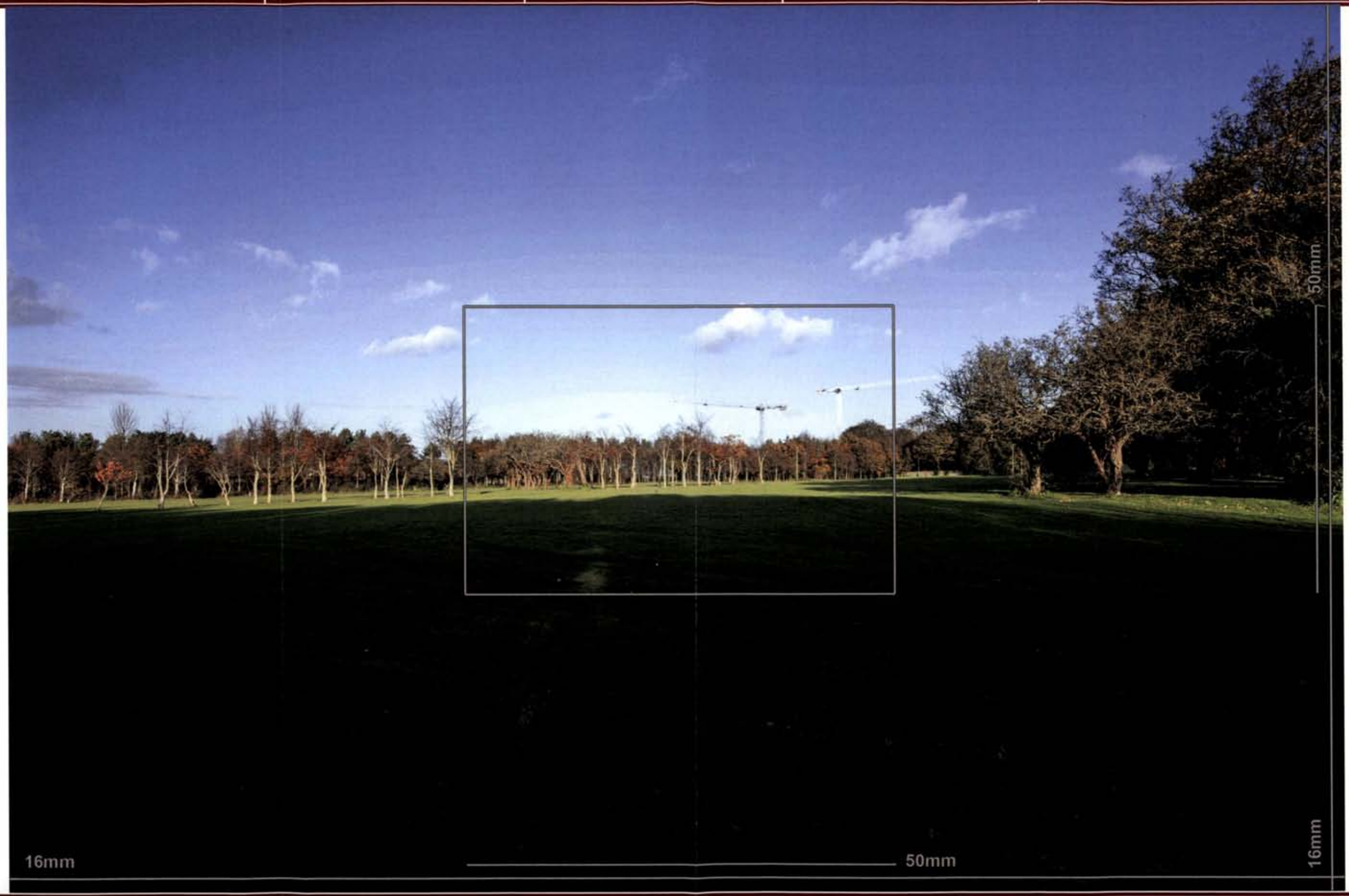
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 178m	Date & Time: 08/11/202313:35:04

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 17
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 178m	Date & Time: 08/11/202313:35:04

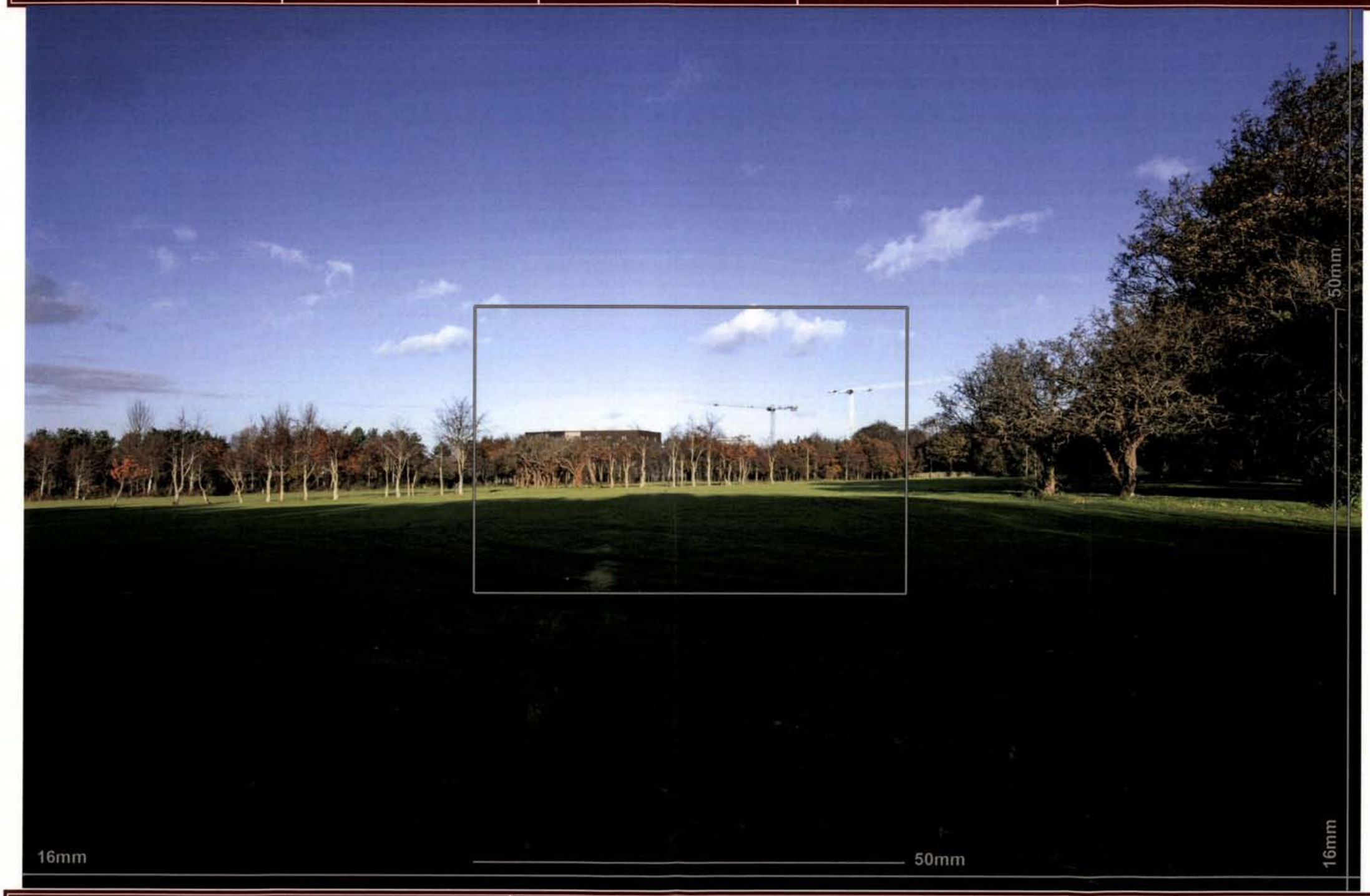
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 17
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 134.75m	Date & Time: 15/11/202313:32:51



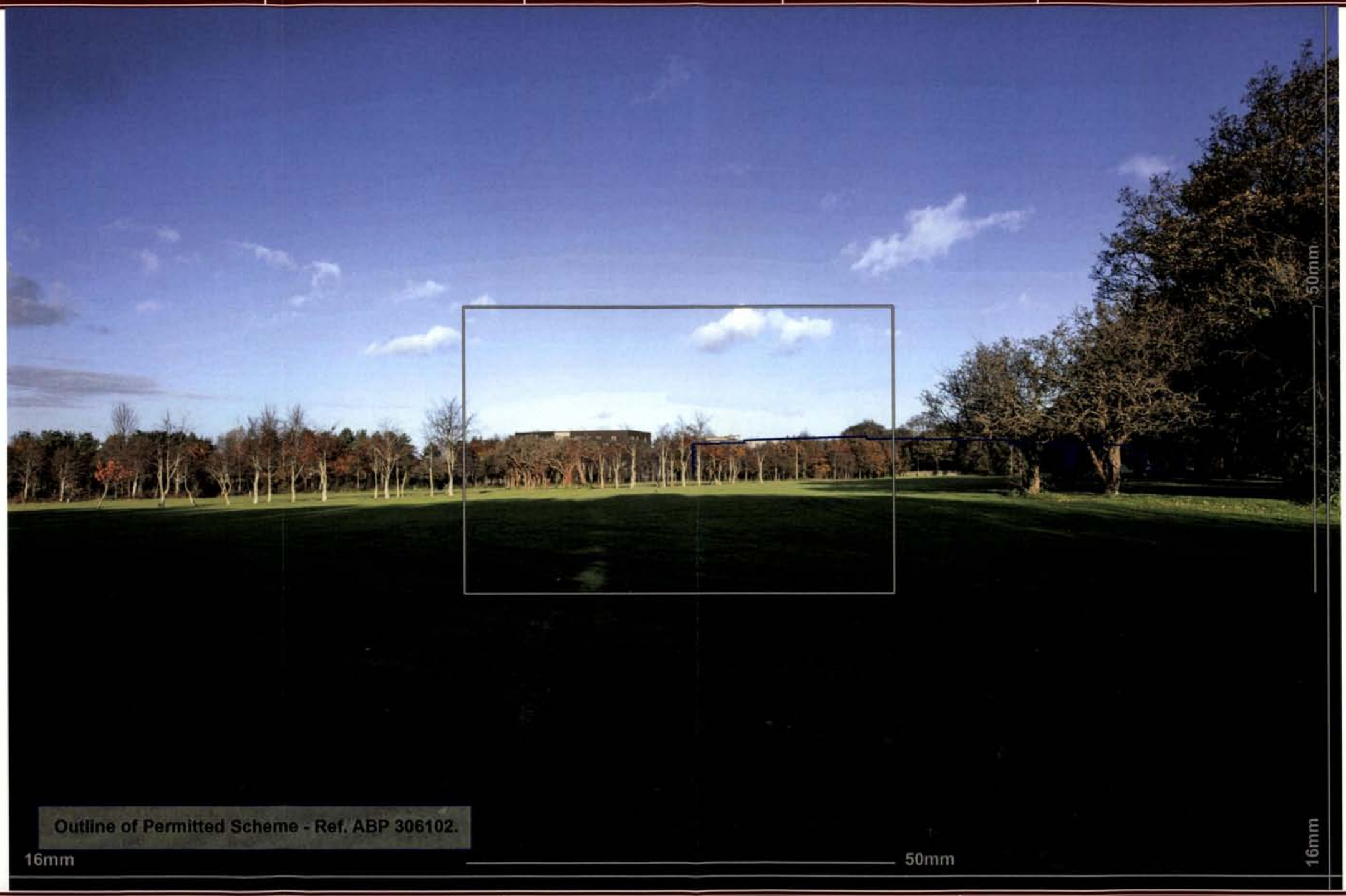
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 18
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 134.75m	Date & Time: 15/11/202313:32:51



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 18
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 134.75m	Date & Time: 15/11/202313:32:51



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 18
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 50mm	Approx Dist: 985.13m	Date & Time: 08/11/202314:06:02

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 19
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 50mm	Approx Dist: 985.13m	Date & Time: 08/11/202314:06:02

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 19
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 50mm	Approx Dist: 985.13m	Date & Time: 08/11/202314:06:02

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 19
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 70mm	Approx Dist: 5644.70m	Date & Time: 08/11/202315:25:05

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 20
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

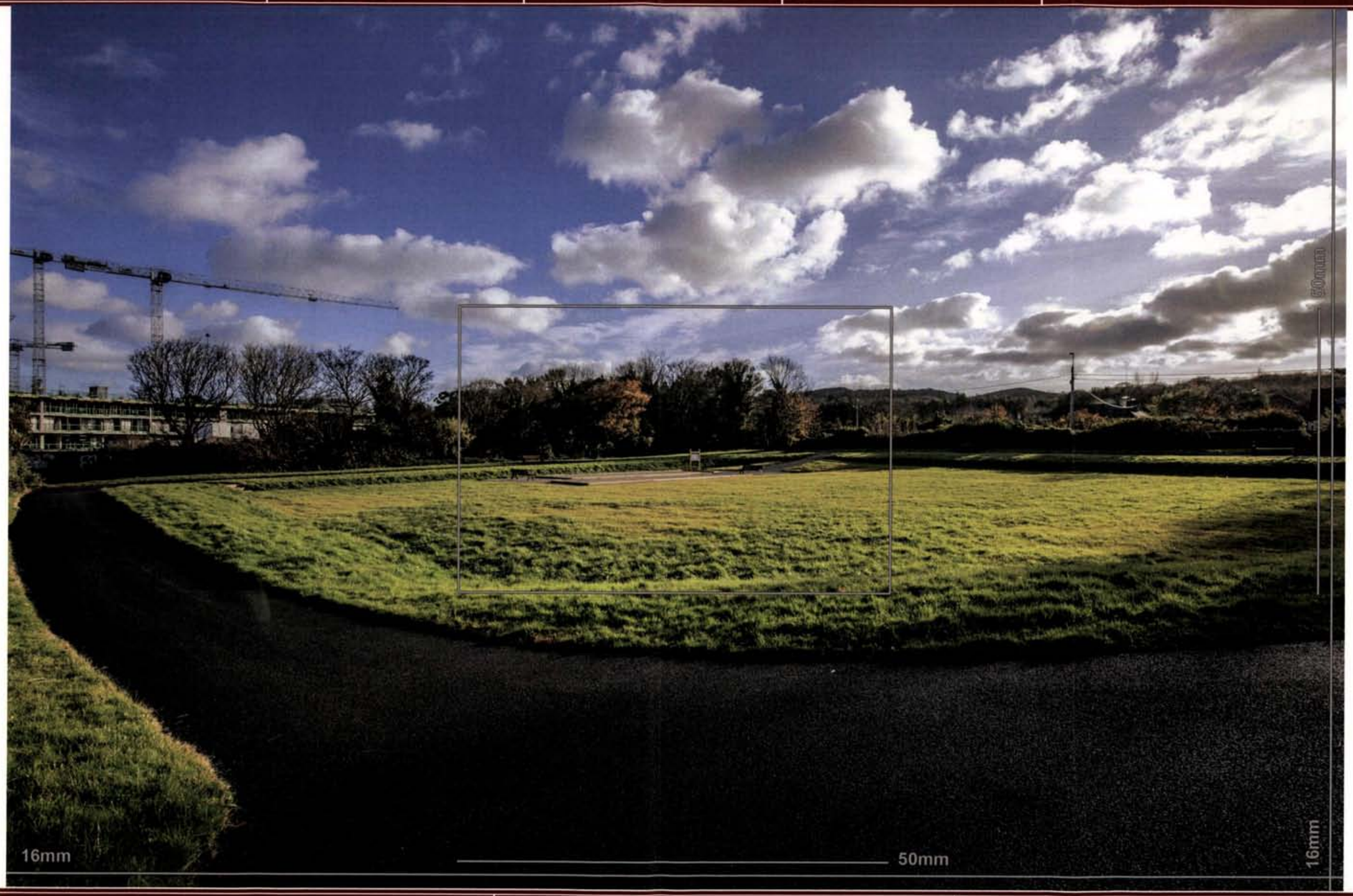
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 70mm	Approx Dist: 5644.70m	Date & Time: 08/11/202315:25:05

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 20
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF24-70mmf/4LISUSM	Focal Length: 70mm	Approx Dist: 5644.70m	Date & Time: 08/11/202315:25:05

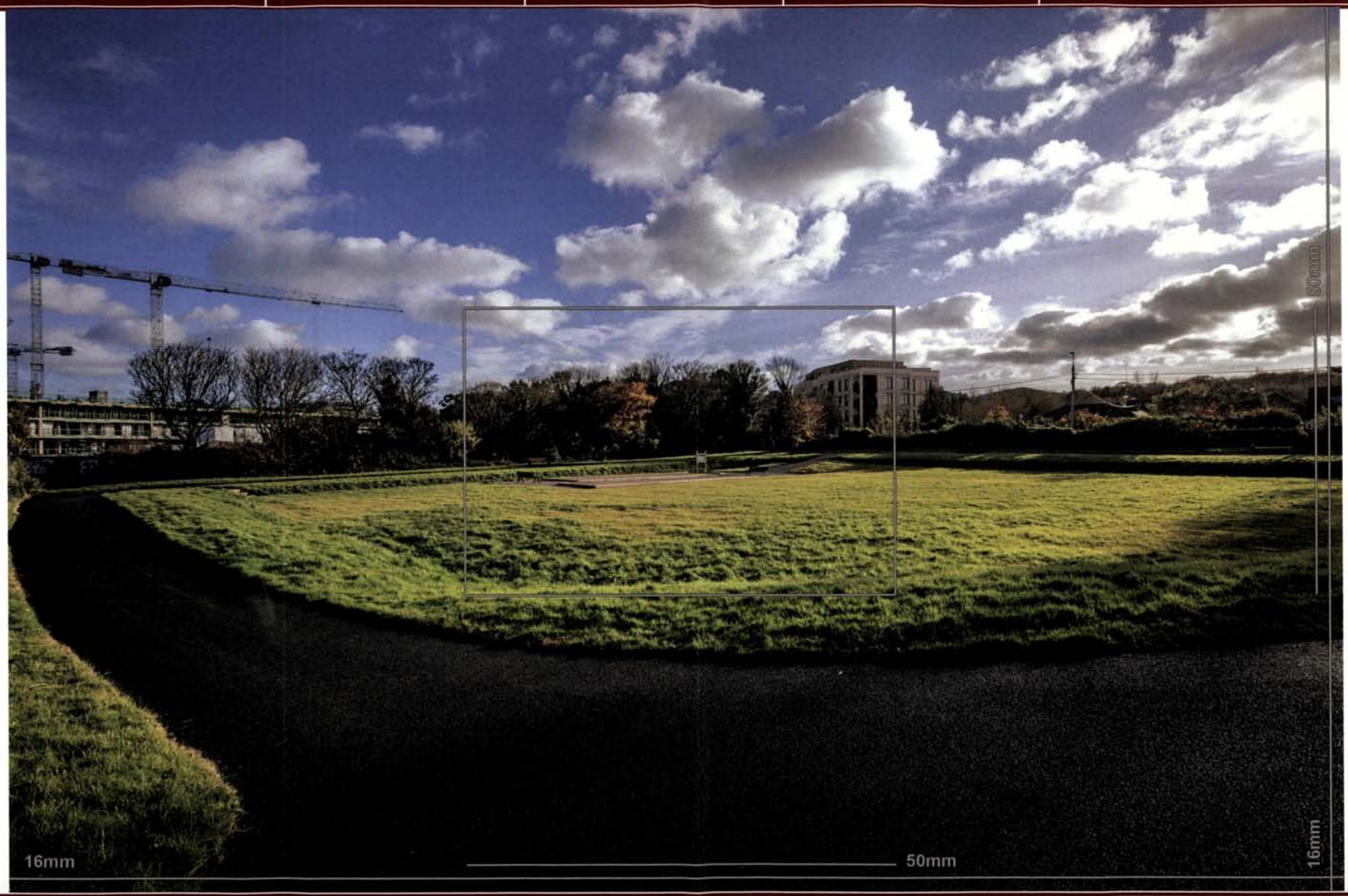
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 20
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 86.88m	Date & Time: 15/11/202314:08:06



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 21
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 86.88m	Date & Time: 15/11/202314:08:06



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 21
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

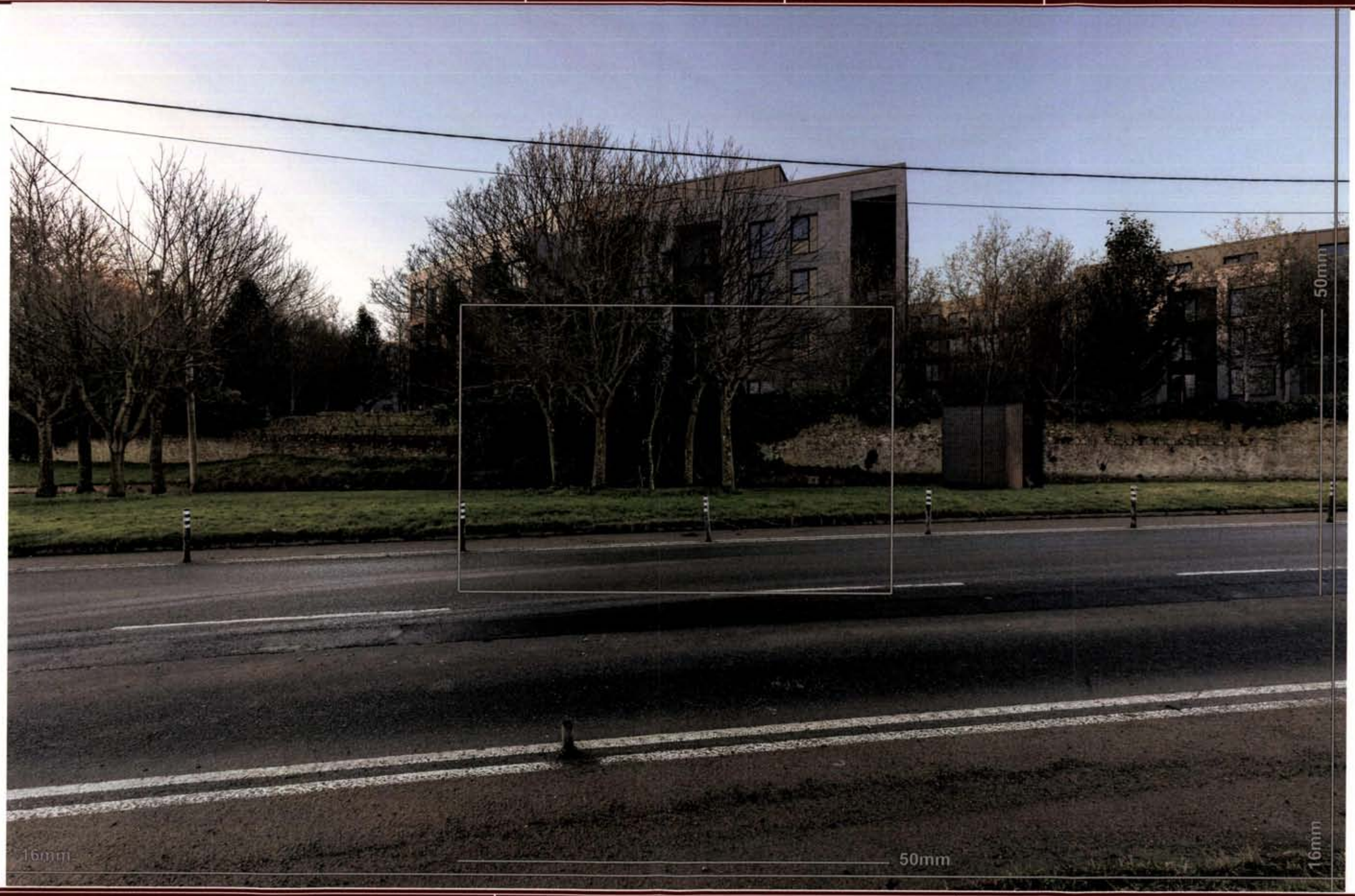
Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 86.88m	Date & Time: 15/11/202314:08:06

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed and Neighbouring VVM 21
		Imagery by 3D DESIGN BUREAU Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 34.50m	Date & Time: 30/01/2024,09:25:00

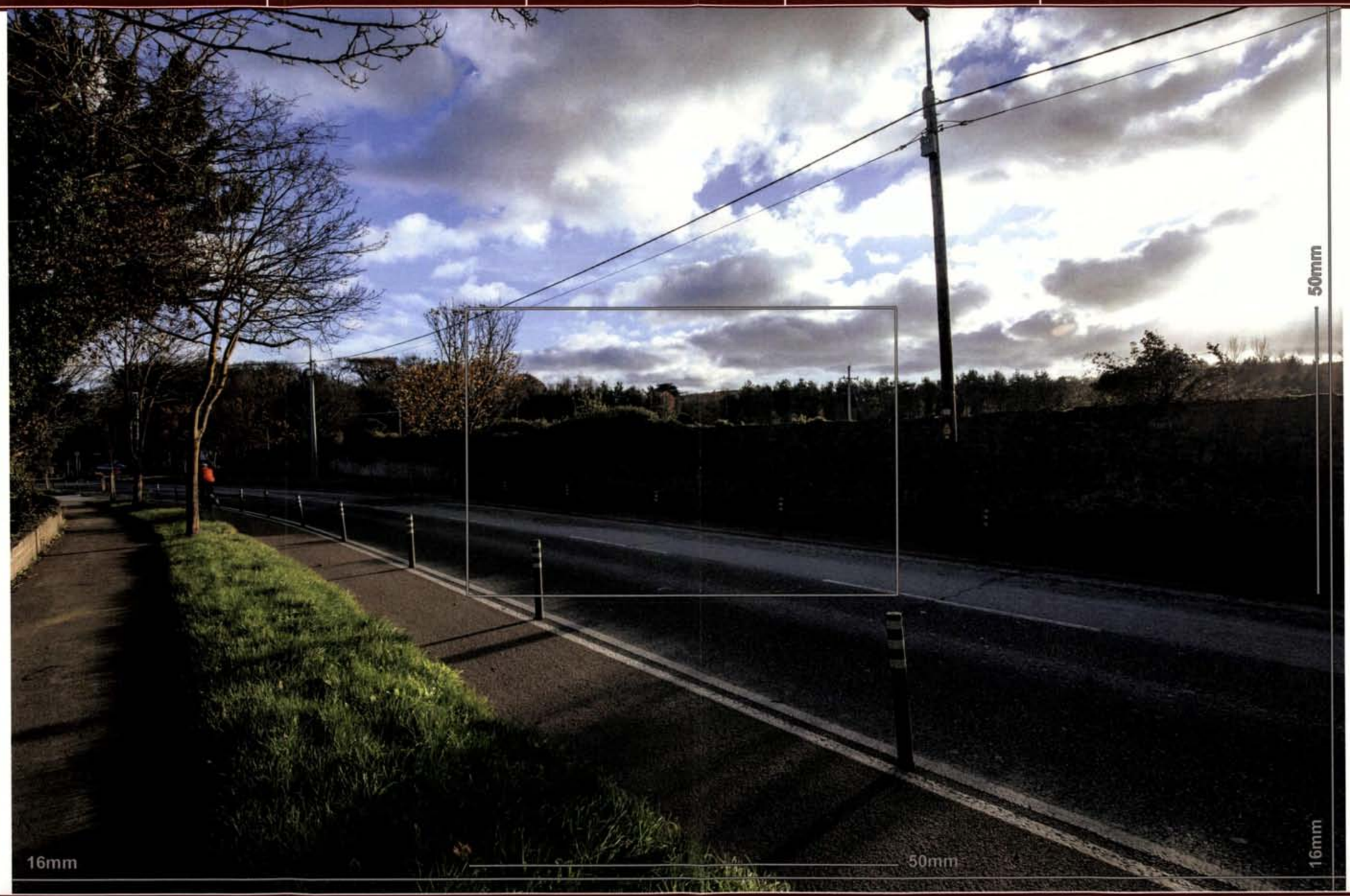
Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 22
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 34.50m	Date & Time: 30/01/2024,09:25:00



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 22
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 14.13m	Date & Time: 15/11/202314:17:54



Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Baseline VVM 23
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

Camera Type: Canon EOS 5D Mark IV	Lens Type: EF16-35mmf/4LISUSM	Focal Length: 16mm	Approx Dist: 14.13m	Date & Time: 15/11/202314:17:54

Project Title: Deer Park Howth LRD	Applicant Name: GLL PRS Holdco. Limited	Image Title: Proposed VVM 23
	Imagery by 3D DESIGN BUREAU	Tel: 01 288 0186 www.3ddesignbureau.com info@3ddesignbureau.com

3D DESIGN BUREAU

APPENDIX

Methodology
Verified Views Montages (VVM)

Table Of Contents **Page**

1.Overview

This methodology has been prepared by 3D Design Bureau to explain the production of Verified View Montages (VVM). The preparation and presentation of reliable verifiable visual information is a key component to the writing of Landscape Visual Impact Assessment reports. It should be noted that VVMs are technical images and should be produced and used in a technically appropriate manner.

This booklet maybe accompanied by the inclusion of a number of CGIs from various viewpoint locations within the proposed site. These have been produced to give a better understanding of the design intent from a close range perspective. Whilst we have included soft landscaping that reflects the proposed design as close as possible, artistic license may have been used for certain planting and trees with regard to species, size and exact locations.

2.What Is A Verified View Montage

A Verified View Montage (VVM) is an accurate visual representation of the potential impact (or lack there of) that a proposed development may have on its surrounding environment when constructed. VVMs are produced using technical scientific verification methods, through the use of photography, surveying, 3D modelling, rendering and post-production.
Verified View Montages work by using the correct geospatial insertion of accurate and detailed digital 3D models in the existing landscape allowing for a photorealistic view of the planned development in its intended location.
The correct combination of all these fields of expertise will deliver a result in which we believe and trust to be accurate for official usage by the client for their intended purposes (ex. Planning applications, impact studies,...).

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3.Methodology

3.1 Project Planning

Following appointment to the project, a desktop study is carried out with a full list of suggested views being drawn up for review prior to visiting the site. This is carried
out between 3D Design Bureau, the client, and the planning consultant.

Note: If a LVIA report is being written by a third party (landscape architect or planning consultant), the medium to long range views will be guided by them. After obtaining a full list of viewpoint locations, it is reviewed, checked and a plan for the taking of baseline photographs is put in place.
Note: 3D modelling of the proposed scheme can, and usually is, commenced prior to the photographic site visit.

3.2 Data Capture: High Resolution Baseline Photography

Every baseline photograph is captured in raw settings using a high-resolution digital SLR camera. This allows for the maximum possible information to be retained in the digital file. It also avoids the file being altered by any internal camera processing definitions, which retains the maximum control and fidelity on the end results.

The focal lengths used depend on the surrounding context and proximity to the subject site. 3D Design Bureau use high quality lenses with focal lengths that allow for capturing enough surrounding context without compromising quality and fidelity, by avoiding excessive barrelling, distortion, or aberrations. All shots are taken horizontally with the use of a 50mm lens (where possible) and wider angle also.

Note: Although the 50mm focal length represents the perceived scale of the human eye, it does not represent the human field of view and therefore should not necessarily be used to show the proposed development in its context. Peripheral vision needs to be accounted for and whilst the 50mm lens option is recommended in the *British Landscape Institute Technical Guidance Note*, this does not take into account the dynamic movement of the human eye.

Furthermore, panoramic VVMs are described in the *British Landscape Institute Technical Guidance Note*. 3DDB do not produce these type of VVMs as they are made up of a series of individual VVMs stitched together. The stitching process is a non repeatable action which can result in different outputs of the same image each time. Therefore accuracy and verifiability can be called into question.

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3.Methodology

3.2 Data Capture: High Resolution Baseline Photography (cont`d)

Each photo location is correctly recorded and marked as follows

On-Site:

The tripod location on site is paint marked and photographed in relation to existing elements. (Fig 1 below)
The location of each photo is manually marked on a printed map while on site.
The camera height is recorded.

In-Studio:

All photographs go through post processing back in the studio. The full set of photos along with a viewpoint location map (Fig 2 below) are issued to the client for review and to choose the best shots that will demonstrate the visual impact that the proposed scheme may/may not have. For each photo at each location, two focal lengths will be issued – the 50mm option and a wider field of view option. The most appropriate shot will be chosen depending on the surrounding context and location of the shot. See earlier section 3.2 for further explanation.

Fig.1: Camera Location marked and photographed.

Fig.2: Viewpoint location map post site visit.

3.Methodology

3.2 Data Capture: High Resolution Baseline Photography (cont`d)

Sample baseline photographs prior to selection and prior to marking up for surveying.

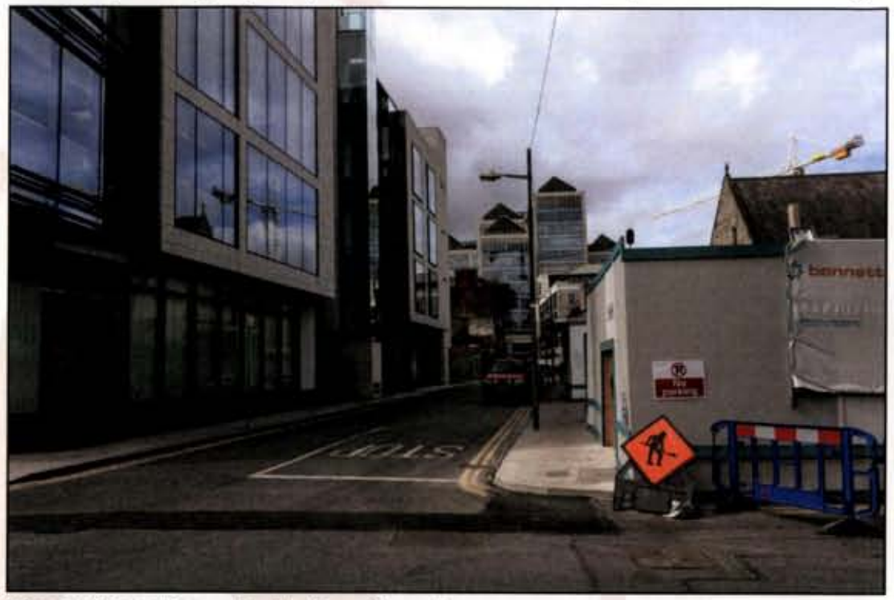

Fig.3: Baseline photo for view 5

Fig.4: Baseline photo for view 3

Fig.5: Baseline photo for view 4

Fig.6: Baseline photo for view 9

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3.Methodology

3.3 Baseline Photo Surveying

When all baseline photos are chosen for the VVMs, each one is marked up in studio as per Fig 7 below. Fixed reference points within each photo, such as parapet heights, kerbing, lamp posts etc are coloured coded on the baseline photos. All 'marked up' baseline photos are then issued to our qualified topographical surveyor for surveying purposes.
The survey team records the camera/tripod position using GPS and Total Station to an accuracy of +/-1cm Northing and Easting and to an accuracy of +/- 2cm Elevation. The 'marked up' fixed reference points identified in each photo are then surveyed to establish exact orientation of the view and to verify the photomontage process. (Fig 8 below). This survey data is later modelled and included in the digital 3D model of the proposed development. (See section 3.4)

Fig.7: Fixed reference points marked for surveyour.

Fig.8: Fixed reference points surveyed and numbered by surveyor.

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3.Methodology

3.4 3D Modelling & Visualisation

3D Modelling

An accurate digital 3D model of the 'proposed' development is produced using 3D software of choice. All of 3D Design Bureau's 3D modelling is carried out within AutoDesk's Revit. The digital 3D model is created from a combination of the third party architectural, engineering and landscape drawings. All proposed model information is contained in the one file and it is always positioned relative to the existing topographical site survey information supplied.

The 'marked up' fixed reference points (see section 3.3) which have been surveyed, are also modelled along with any other relevant survey information from the supplied topographical survey drawings. As stated above, the proposed 3D model and survey 3D model information are geospatially positioned relative to one another. This is imperative to ensure the accurate positioning and camera matching of the proposed digital 3D model within each chosen photo.

Visualisation

Once the digital 3D Revit model is complete, it is handed over to the 3D visualisation team for production. This stage of production involves matching of textures & finishes, lighting conditions and asset population for the proposed scheme. This ensures the accurate visual representation of the digital 3D model is as close as possible to the intended future 'As Built' development. Note: For accurate camera matching of the digital model to the baseline photography (which can take place prior to the visualisation process) please see Section 3.5.

There are various 3D visualisation software's that are widely used for this stage of production. 3D Design Bureau use Autodesk 3D Studio Max as its main software for the visualisation process. This is accepted as the leading industry standard for architectural visualisation work and production of VVMs.

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3.Methodology

3.4 3D Modelling & Visualisation

Fig.8: Digital 3D model including the fixed reference points

Fig.9: Fixed reference points surveyed and numbered by surveyor.

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3.Methodology

3.5 Camera Matching / Rendering / Post Production

Following the completion of the 3D visualisation process, Section 3.4, (but in some instances prior to this) the following methodology is applied to ensure views are verifiable.

Camera Matching

All of the information recorded at the time of the baseline photographic site visit, that is, camera co-ordinates, angle of view, and direction of view, is programmed into the virtual camera within the 3D software package of choice - 3D Studio Max. Insertion of digital cameras within the software, with the matching attributes of the physical camera, is carried out. All elements of the photo survey, that have been surveyed and included in the digital model and geolocated relative to the proposed development are a key component to the camera matching process. This careful methodology ensures that the size, position, and height, of the proposed development in each VVM is correct to an accuracy of 0.33% i.e. +/- 1mm on an A3 print.

Rendering

Following the camera matching and 3D visualisation process the views are 'rendered' at high resolution and placed onto its matching baseline photograph using Adobe Photoshop software. The mathematical accuracy is then double checked and verified by ensuring that existing 'marked up' fixed reference p point features, which were also rendered, line up exactly in the baseline photo.

Post Production

Post production for all views is the last stage in the VVM process. The VVM specialist establishes which existing features such as buildings, landscape and trees, are in the foreground of the proposed development and those that are in the background, i.e. which features will mask the development and which ones will appear behind the development. When it is found that the development is not visible due to foreground features, its extremities will be indicated with a red outline. Furthermore on wide angle chosen views, the extent of 50mm lens is identified on the shot.

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3.Methodology

3.5 Camera Matching / Rendering / Post Production

Fig.10: Fixed reference points for surveyor on Baseline untreated photo.

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3.Methodology

3.5 Camera Matching / Rendering / Post Production

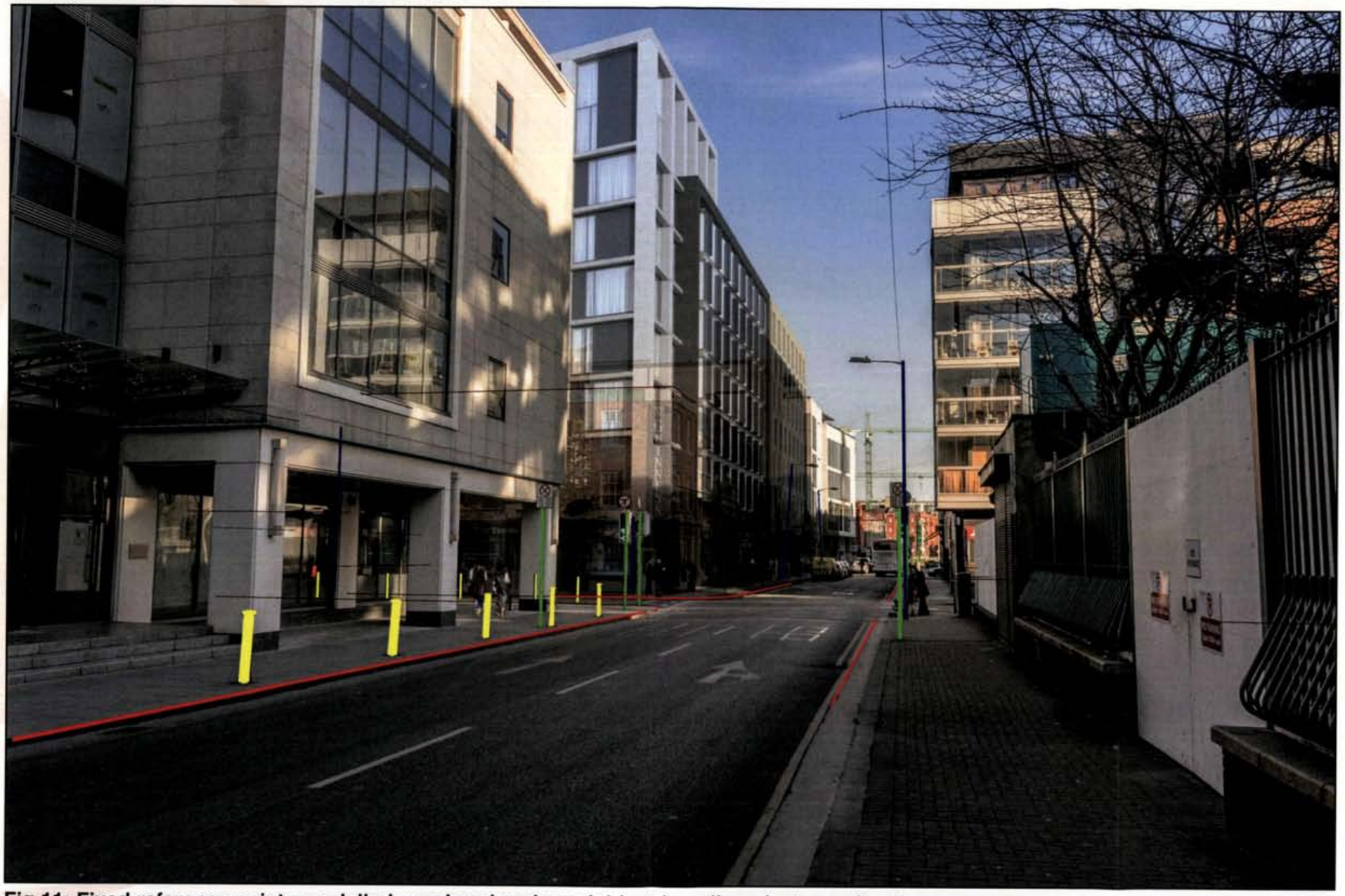

Fig.11: Fixed reference points modelled, rendered and overlaid on baseline photo confirming accuracy

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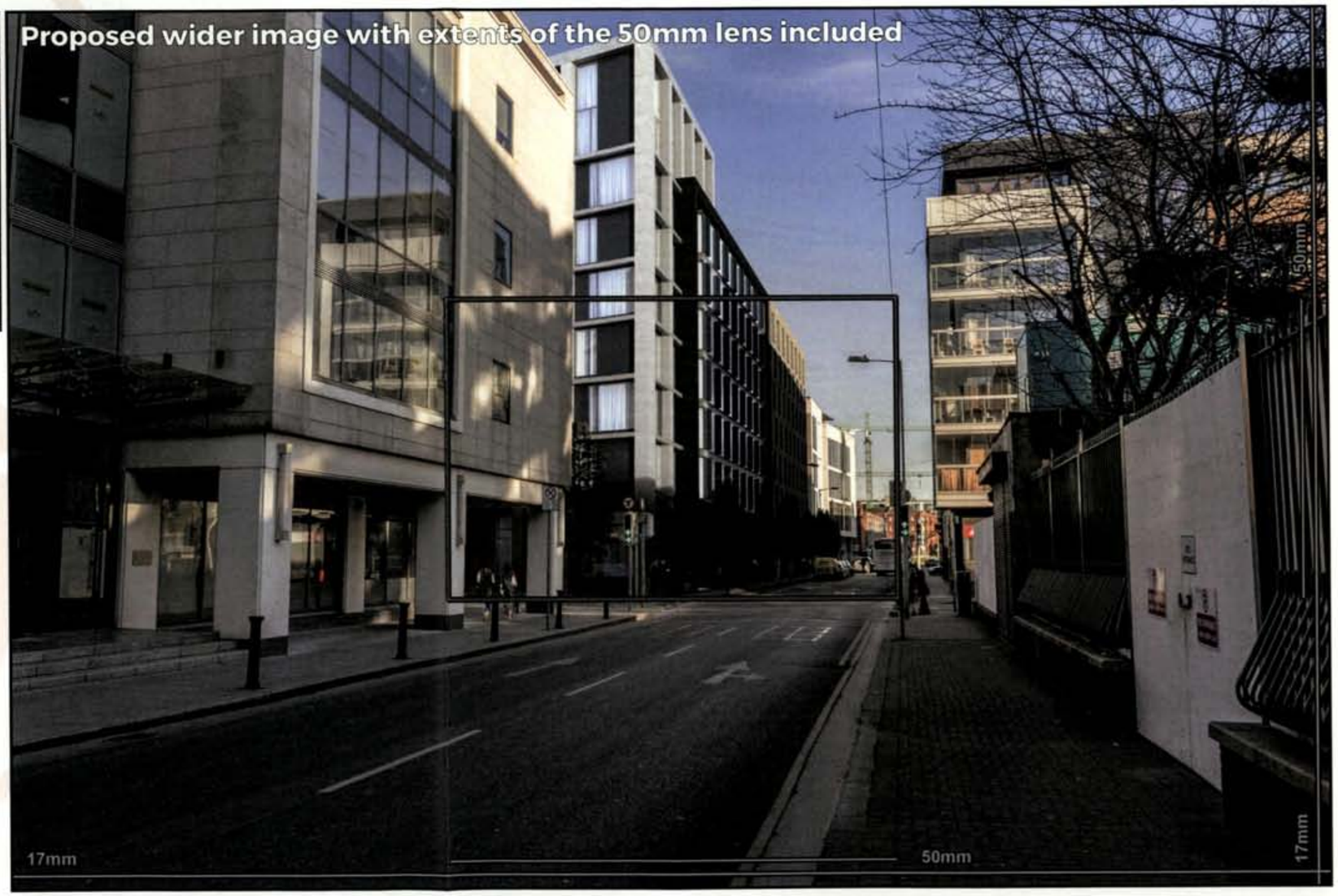
4. Results

The resulting VVM, having gone through this extensive procedure, is classed as an accurate and verifiable representation of the proposed development as viewed from the selected photo locations. This shows, as closely as possible, any future impact a proposed development may have on the surrounding environment and existing buildings. It should be noted that the foundation of any Landscape/Townscape Visual Impact Assessment (LVIA / TVIA) report are accurate verified view montages.



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APPENDIX 6.1
TRAFFIC SURVEY DATA

VOLUME III
APPENDICES TO
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	A to D - Station Rd to Howth Rd						Veh. Total	A to C - Station Rd to Greenfield Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	21	10	2	0	0	0	33	10	4	0	1	0	0	15
07:15	32	14	2	0	0	0	48	30	14	1	0	0	0	45
07:30	26	13	1	0	0	0	40	21	9	0	0	0	0	30
07:45	33	15	2	0	0	0	50	33	3	0	0	0	0	36
Hour	112	52	7	0	0	0	171	94	30	1	1	0	0	126
08:00	13	5	1	0	0	0	19	50	1	0	0	2	0	53
08:15	32	4	2	1	0	0	39	76	3	1	0	5	1	86
08:30	49	7	1	0	0	0	57	61	2	1	0	0	0	64
08:45	64	12	0	0	0	0	76	30	7	1	0	2	0	40
Hour	158	28	4	1	0	0	191	217	13	3	0	9	1	243
09:00	37	21	1	1	0	1	61	21	5	3	1	0	0	30
09:15	27	15	2	3	0	0	47	21	3	3	0	0	0	27
09:30	28	7	1	1	0	0	37	13	6	0	0	0	0	19
09:45	68	12	3	0	0	0	83	26	8	0	0	0	0	34
Hour	160	55	7	5	0	1	228	81	22	6	1	0	0	110
10:00	37	5	3	0	0	0	45	23	3	1	0	0	0	27
10:15	35	8	3	2	0	0	48	13	3	2	0	0	0	18
10:30	25	7	3	0	0	0	35	5	2	1	0	0	0	8
10:45	55	6	2	0	1	0	64	19	3	1	0	0	0	23
Hour	152	26	11	2	1	0	192	60	11	5	0	0	0	76
11:00	29	9	1	0	0	0	39	15	2	0	0	0	0	17
11:15	32	10	2	1	0	0	45	15	9	2	0	0	0	26
11:30	45	11	0	2	0	0	58	20	4	0	0	0	0	24
11:45	45	10	4	0	0	0	59	11	4	0	1	0	0	16
Hour	151	40	7	3	0	0	201	61	19	2	1	0	0	83
12:00	44	7	1	0	0	0	52	19	3	1	0	0	0	23
12:15	30	4	3	0	0	0	37	7	1	0	0	0	0	8
12:30	52	7	1	0	0	0	60	24	1	1	0	0	0	26
12:45	66	9	3	0	0	0	78	29	3	0	1	1	0	34
Hour	192	27	8	0	0	0	227	79	8	2	1	1	0	91
13:00	52	5	0	0	0	0	57	23	3	0	0	0	0	26
13:15	50	1	3	0	0	0	54	17	2	0	1	0	0	20
13:30	37	3	1	1	0	0	42	33	3	1	0	0	0	37
13:45	55	8	1	0	0	0	64	19	3	0	1	0	0	23
Hour	194	17	5	1	0	0	217	92	11	1	2	0	0	106
14:00	41	5	1	0	0	0	47	15	3	0	1	0	1	20
14:15	32	5	1	1	1	0	40	37	1	0	1	0	0	39
14:30	41	12	0	0	0	0	53	22	2	0	0	1	0	25
14:45	43	5	2	0	1	0	51	24	1	1	1	1	0	28
Hour	157	27	4	1	2	0	191	98	7	1	3	2	1	112
15:00	37	5	3	0	0	0	45	33	2	1	1	2	0	39
15:15	49	7	1	0	0	0	57	61	1	0	0	0	0	62
15:30	44	6	1	0	0	0	51	24	1	0	0	2	0	27
15:45	54	6	0	0	0	0	60	15	2	3	0	2	1	23
Hour	184	24	5	0	0	0	213	133	6	4	1	6	1	151
16:00	55	7	1	0	0	0	63	21	2	0	1	1	2	27
16:15	25	1	0	0	0	0	26	25	0	0	0	0	1	26
16:30	66	4	0	0	0	0	70	40	1	0	1	0	0	42
16:45	50	3	1	0	0	0	54	37	4	0	0	0	0	41
Hour	196	15	2	0	0	0	213	123	7	0	2	1	3	136
17:00	49	3	0	0	0	0	52	20	1	0	1	0	0	22
17:15	52	5	1	0	0	0	58	21	1	0	0	0	0	22
17:30	62	2	0	0	0	0	64	31	0	0	0	0	0	31
17:45	63	2	1	0	0	0	66	40	0	0	0	0	0	40
Hour	226	12	2	0	0	0	240	112	2	0	1	0	0	115
18:00	50	2	1	0	0	1	54	27	0	0	0	0	0	27
18:15	57	2	0	0	0	0	59	26	2	0	0	0	0	28
18:30	47	1	0	0	0	0	48	25	3	0	0	0	0	28
18:45	64	4	0	0	0	0	68	34	0	0	0	0	0	34
Hour	218	9	1	0	0	1	229	112	5	0	0	0	0	117
Total	2100	332	63	13	3	2	2513	1262	141	25	13	19	6	1466

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	A to B - Station Rd to Dublin Rd						Veh. Total	B to A - Dublin Rd to Station Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	3	0	0	0	0	0	3	2	0	0	0	0	0	2
07:15	4	0	0	0	0	0	4	1	0	0	0	0	0	1
07:30	3	1	0	0	0	0	4	0	1	0	0	0	0	1
07:45	5	1	0	1	0	0	7	3	1	0	0	0	0	4
Hour	15	2	0	1	0	0	18	6	2	0	0	0	0	8
08:00	3	0	0	0	0	0	3	2	1	0	0	0	0	3
08:15	5	0	0	0	0	0	5	4	1	0	0	0	0	5
08:30	6	1	0	0	0	0	7	3	1	0	0	0	0	4
08:45	6	0	0	0	0	0	6	8	1	1	0	0	0	10
Hour	20	1	0	0	0	0	21	17	4	1	0	0	0	22
09:00	1	2	0	0	0	0	3	7	0	1	0	0	0	8
09:15	3	0	0	0	0	0	3	6	0	0	0	0	0	6
09:30	6	0	0	0	0	0	6	4	0	0	0	0	0	4
09:45	4	0	0	0	0	0	4	4	2	0	0	0	0	6
Hour	14	2	0	0	0	0	16	21	2	1	0	0	0	24
10:00	4	1	0	0	0	0	5	1	3	0	0	0	0	4
10:15	3	2	0	0	0	1	6	1	1	0	0	0	0	2
10:30	2	0	0	0	0	0	2	4	0	0	0	0	0	4
10:45	3	0	0	0	0	0	3	4	1	0	0	0	0	5
Hour	12	3	0	0	0	1	16	10	5	0	0	0	0	15
11:00	1	1	1	0	0	0	3	2	2	0	0	0	0	4
11:15	4	1	0	0	0	0	5	2	1	0	0	0	0	3
11:30	1	3	0	0	0	0	4	9	0	0	0	0	0	9
11:45	4	1	0	0	0	0	5	7	1	0	0	0	0	8
Hour	10	6	1	0	0	0	17	20	4	0	0	0	0	24
12:00	2	1	0	0	0	0	3	9	1	1	0	0	0	11
12:15	4	1	0	0	0	0	5	13	2	0	0	0	0	15
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Hour	14	2	0	0	0	0	16	33	3	1	0	0	0	37
13:00	4	0	0	0	0	0	4	5	0	0	0	0	0	5
13:15	2	0	0	0	0	0	2	4	0	0	0	1	0	5
13:30	6	0	0	0	0	0	6	5	0	0	1	1	0	7
13:45	6	2	0	0	0	0	8	7	1	0	0	0	0	8
Hour	18	2	0	0	0	0	20	21	1	0	1	2	0	25
14:00	4	2	0	0	0	0	6	4	2	0	0	0	0	6
14:15	6	2	0	0	0	0	8	4	0	0	0	0	0	4
14:30	3	0	0	0	0	0	3	0	1	0	0	0	0	1
14:45	3	0	0	0	0	0	3	7	0	0	0	0	0	7
Hour	16	4	0	0	0	0	20	15	3	0	0	0	0	18
15:00	3	0	0	0	0	0	3	2	1	0	0	0	0	3
15:15	2	0	0	0	0	0	2	2	0	0	0	0	0	2
15:30	1	0	0	0	0	0	1	3	0	0	0	1	0	4
15:45	1	1	0	0	0	0	2	5	1	0	0	0	0	6
Hour	7	1	0	0	0	0	8	12	2	0	0	1	0	15
16:00	5	0	0	0	0	0	5	5	1	0	0	0	0	6
16:15	2	0	0	0	0	0	2	2	1	0	0	0	0	3
16:30	2	0	0	0	0	0	2	2	0	0	0	0	0	2
16:45	5	0	0	0	0	0	5	5	0	0	0	0	0	5
Hour	14	0	0	0	0	0	14	14	2	0	0	0	0	16
17:00	3	1	0	0	0	0	4	8	0	0	0	0	0	8
17:15	6	1	0	0	0	0	7	10	0	0	0	0	0	10
17:30	10	0	0	0	0	0	10	7	0	0	0	0	0	7
17:45	1	0	0	0	0	0	1	10	1	0	0	0	0	11
Hour	20	2	0	0	0	0	22	35	1	0	0	0	0	36
18:00	4	0	0	0	0	0	4	9	0	0	0	0	0	9
18:15	7	0	0	0	0	0	7	9	1	0	0	0	0	10
18:30	12	0	0	0	0	0	12	7	1	0	0	0	0	8
18:45	4	1	0	0	0	0	5	13	0	0	0	0	0	13
Hour	27	1	0	0	0	0	28	38	2	0	0	0	0	40
Total	187	26	1	1	0	1	216	242	31	3	1	3	0	280

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	B to D - Dublin Rd to Howth Rd						Veh. Total	B to C - Dublin Rd to Greenfield Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	19	1	0	1	0	0	21	3	0	0	0	1	0	4
07:15	28	4	1	0	1	1	35	10	2	1	0	0	1	14
07:30	16	3	0	0	0	0	19	27	2	0	0	0	0	29
07:45	28	7	1	0	0	0	36	27	3	1	1	0	0	32
Hour	91	15	2	1	1	1	111	67	7	2	1	1	1	79
08:00	45	5	0	0	1	0	51	74	3	1	1	1	0	80
08:15	54	6	0	1	0	1	62	68	2	2	0	0	0	72
08:30	58	4	0	0	0	0	62	48	3	1	0	1	0	53
08:45	88	5	1	0	1	0	95	35	3	1	1	0	0	40
Hour	245	20	1	1	2	1	270	225	11	5	2	2	0	245
09:00	44	3	2	0	1	0	50	19	1	0	0	1	0	21
09:15	45	8	2	0	0	0	55	36	2	0	0	1	0	39
09:30	42	8	1	0	0	0	51	28	3	1	0	0	0	32
09:45	43	4	2	1	0	1	51	20	3	2	0	0	0	25
Hour	174	23	7	1	1	1	207	103	9	3	0	2	0	117
10:00	55	3	0	0	2	0	60	20	4	0	0	0	0	24
10:15	45	7	1	0	0	0	53	16	1	1	0	0	0	18
10:30	40	4	3	0	1	2	50	19	0	0	1	1	0	21
10:45	50	7	0	0	1	0	58	26	3	2	0	0	0	31
Hour	190	21	4	0	4	2	221	81	8	3	1	1	0	94
11:00	57	8	1	0	0	0	66	21	4	0	0	0	0	25
11:15	58	6	3	0	1	0	68	28	2	1	0	0	0	31
11:30	49	8	3	2	0	0	62	24	2	0	0	1	0	27
11:45	51	5	0	1	1	0	58	34	0	0	0	0	0	34
Hour	215	27	7	3	2	0	254	107	8	1	0	1	0	117
12:00	56	8	3	0	0	1	68	22	2	0	0	0	1	25
12:15	55	3	3	1	1	0	63	30	0	0	0	0	0	30
12:30	54	5	3	1	0	0	63	33	2	0	0	0	0	35
12:45	60	5	1	0	1	0	67	32	1	2	1	1	0	37
Hour	225	21	10	2	2	1	261	117	5	2	1	1	1	127
13:00	65	5	3	0	0	1	74	25	6	0	1	0	0	32
13:15	60	1	2	0	1	0	64	46	0	0	0	0	0	46
13:30	38	1	2	1	0	1	43	35	6	1	0	0	0	42
13:45	46	7	0	0	1	0	54	26	3	0	0	2	3	34
Hour	209	14	7	1	2	2	235	132	15	1	1	2	3	154
14:00	51	5	0	1	0	0	57	33	1	2	0	0	1	37
14:15	71	4	0	1	1	0	77	36	2	1	0	0	0	39
14:30	55	6	3	0	0	0	64	33	3	0	0	1	2	39
14:45	69	5	0	0	0	0	74	40	1	0	0	2	1	44
Hour	246	20	3	2	1	0	272	142	7	3	0	3	4	159
15:00	52	1	1	0	1	1	56	37	1	1	0	0	0	39
15:15	63	0	0	0	0	0	63	37	2	1	0	0	1	41
15:30	58	3	0	0	1	0	62	37	4	0	0	0	1	42
15:45	68	4	0	1	0	1	74	34	1	1	0	1	0	37
Hour	241	8	1	1	2	2	255	145	8	3	0	1	2	159
16:00	72	4	1	0	0	0	77	37	2	0	0	1	0	40
16:15	62	4	0	0	0	0	66	31	2	0	0	0	0	33
16:30	67	1	0	0	1	1	70	33	3	0	0	0	0	36
16:45	65	3	0	0	0	0	68	42	2	0	0	0	0	44
Hour	266	12	1	0	1	1	281	143	9	0	0	1	0	153
17:00	92	3	0	0	0	1	96	40	2	0	0	1	0	43
17:15	51	2	0	0	1	1	55	27	1	0	0	0	1	29
17:30	69	4	1	0	1	0	75	41	3	0	0	0	0	44
17:45	68	2	0	0	1	1	72	33	4	0	0	1	0	38
Hour	280	11	1	0	3	3	298	141	10	0	0	2	1	154
18:00	54	2	0	0	1	0	57	31	1	0	0	0	0	32
18:15	67	2	0	0	0	0	69	35	1	0	0	0	1	37
18:30	49	3	0	0	1	0	53	39	1	1	0	1	0	42
18:45	48	1	0	0	0	0	49	28	0	0	0	0	0	28
Hour	218	8	0	0	2	0	228	133	3	1	0	1	1	139
Total	2600	200	44	12	23	14	2893	1536	100	24	6	18	13	1697

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	C to B - Greenfield Rd to Dublin Rd						Veh. Total	C to A - Greenfield Rd to Station Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	16	1	0	0	0	0	17	13	1	0	0	0	0	14
07:15	29	0	0	0	1	0	30	23	1	0	0	0	0	24
07:30	22	2	0	0	0	0	24	33	1	0	1	0	0	35
07:45	34	3	0	0	1	1	39	31	1	0	0	0	0	32
Hour	101	6	0	0	2	1	110	100	4	0	1	0	0	105
08:00	38	1	0	0	0	0	39	25	1	0	0	0	0	26
08:15	56	4	0	0	0	0	60	44	0	0	0	1	0	45
08:30	43	0	0	0	2	1	46	28	1	0	0	4	0	33
08:45	43	0	2	0	0	0	45	34	3	2	0	0	0	39
Hour	180	5	2	0	2	1	190	131	5	2	0	5	0	143
09:00	60	5	0	0	2	0	67	48	0	0	0	2	0	50
09:15	31	0	0	0	1	0	32	23	5	0	0	0	0	28
09:30	23	3	3	0	1	0	30	20	5	1	0	0	0	26
09:45	38	2	0	0	0	0	40	18	0	0	1	0	0	19
Hour	152	10	3	0	4	0	169	109	10	1	1	2	0	123
10:00	32	2	1	0	1	1	37	21	4	0	0	0	0	25
10:15	22	0	0	0	0	0	22	17	3	2	0	0	0	22
10:30	36	3	1	0	0	0	40	31	1	1	0	0	0	33
10:45	24	2	0	0	0	0	26	18	2	1	0	0	0	21
Hour	114	7	2	0	1	1	125	87	10	4	0	0	0	101
11:00	27	6	0	0	2	0	35	15	1	2	0	0	1	19
11:15	21	4	0	0	0	0	25	24	4	0	0	1	0	29
11:30	27	3	2	0	0	0	32	14	1	0	1	0	0	16
11:45	24	5	0	0	0	0	29	23	4	0	0	0	0	27
Hour	99	18	2	0	2	0	121	76	10	2	1	1	1	91
12:00	35	2	1	0	1	0	39	26	3	2	0	0	1	32
12:15	34	2	1	0	0	0	37	23	5	1	2	0	0	31
12:30	36	4	3	0	0	0	43	19	5	0	1	0	0	25
12:45	35	2	1	0	0	0	38	31	2	0	0	0	0	33
Hour	140	10	6	0	1	0	157	99	15	3	3	0	1	121
13:00	23	5	0	0	1	0	29	27	4	0	0	1	0	32
13:15	40	4	1	0	0	0	45	27	7	2	0	0	1	37
13:30	40	3	3	0	0	0	46	22	1	1	1	0	0	25
13:45	50	3	0	0	0	0	53	34	2	0	2	0	0	38
Hour	153	15	4	0	1	0	173	110	14	3	3	1	1	132
14:00	32	3	2	0	2	0	39	29	2	0	0	0	0	31
14:15	33	6	2	0	0	1	42	25	2	0	1	0	0	28
14:30	32	3	0	0	1	0	36	43	3	2	0	0	0	48
14:45	49	2	0	0	1	1	53	42	3	3	1	0	0	49
Hour	146	14	4	0	4	2	170	139	10	5	2	0	0	156
15:00	45	0	1	0	1	1	48	28	6	1	1	1	0	37
15:15	35	1	0	1	0	0	37	27	10	1	0	1	0	39
15:30	42	4	1	0	0	0	47	36	8	2	0	0	0	46
15:45	41	2	0	0	0	0	43	35	2	0	1	3	0	41
Hour	163	7	2	1	1	1	175	126	26	4	2	5	0	163
16:00	39	2	0	0	1	1	43	28	2	3	0	1	0	34
16:15	38	7	0	0	2	1	48	31	8	1	0	0	0	40
16:30	32	5	1	0	0	0	38	33	10	0	0	0	0	43
16:45	42	4	1	0	1	0	48	43	5	1	0	1	0	50
Hour	151	18	2	0	4	2	177	135	25	5	0	2	0	167
17:00	39	1	1	0	1	0	42	25	6	0	0	0	0	31
17:15	24	3	0	0	0	0	27	18	5	0	1	0	0	24
17:30	35	2	0	0	0	0	37	21	4	1	0	0	2	28
17:45	21	3	0	0	0	0	24	32	2	1	1	0	0	36
Hour	119	9	1	0	1	0	130	96	17	2	2	0	2	119
18:00	30	2	0	0	1	0	33	32	3	0	2	0	0	37
18:15	24	2	2	0	0	0	28	23	4	0	0	0	0	27
18:30	31	3	0	0	1	0	35	17	1	1	0	0	0	19
18:45	42	0	0	0	0	0	42	28	3	1	0	0	0	32
Hour	127	7	2	0	2	0	138	100	11	2	2	0	0	115
Total	1645	126	30	1	25	8	1835	1308	157	33	17	16	5	1536

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	C to D - Greenfield Rd to Howth Rd						Veh. Total	D to C - Howth Rd to Greenfield Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1
07:15	0	0	0	0	0	0	0	1	0	0	0	0	0	1
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	1	1	0	0	0	0	2	0	0	0	0	0	0	0
Hour	1	1	0	0	0	0	2	2	0	0	0	0	0	2
08:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1
08:15	2	0	0	0	0	0	2	1	1	0	0	0	0	2
08:30	2	0	0	0	0	0	2	2	0	0	0	0	0	2
08:45	0	0	0	0	0	0	0	4	0	0	0	0	0	4
Hour	4	0	0	0	0	0	4	8	1	0	0	0	0	9
09:00	1	0	0	0	0	0	1	3	0	0	0	0	0	3
09:15	0	0	0	0	0	0	0	2	1	1	0	0	0	4
09:30	3	1	1	0	0	0	5	1	1	0	0	0	0	2
09:45	1	1	0	0	0	0	2	3	1	0	0	0	0	4
Hour	5	2	1	0	0	0	8	9	3	1	0	0	0	13
10:00	0	1	0	0	0	0	1	1	3	0	0	0	0	4
10:15	2	0	0	0	0	0	2	4	0	1	0	0	0	5
10:30	3	0	0	0	0	0	3	2	0	0	0	0	0	2
10:45	0	0	0	0	0	0	0	6	2	0	0	0	0	8
Hour	5	1	0	0	0	0	6	13	5	1	0	0	0	19
11:00	1	0	0	0	0	0	1	2	0	0	0	0	0	2
11:15	5	0	0	0	0	0	5	1	0	0	0	0	0	1
11:30	2	0	1	0	0	0	3	2	0	0	0	0	0	2
11:45	1	0	0	0	0	0	1	1	0	1	0	0	0	2
Hour	9	0	1	0	0	0	10	6	0	1	0	0	0	7
12:00	2	0	0	0	0	0	2	4	1	0	0	0	0	5
12:15	2	1	0	0	0	0	3	4	0	0	0	0	0	4
12:30	2	0	0	0	0	0	2	3	1	0	0	0	0	4
12:45	1	0	0	0	0	0	1	5	0	0	0	0	0	5
Hour	7	1	0	0	0	0	8	16	2	0	0	0	0	18
13:00	1	0	0	0	0	0	1	2	0	0	0	0	0	2
13:15	1	0	0	0	0	0	1	4	0	0	0	0	0	4
13:30	1	0	0	0	0	0	1	13	0	0	0	0	0	13
13:45	0	0	0	0	0	0	0	4	0	0	0	0	0	4
Hour	3	0	0	0	0	0	3	23	0	0	0	0	0	23
14:00	2	2	0	0	0	0	4	5	0	0	0	0	0	5
14:15	4	0	1	0	0	0	5	4	1	0	0	0	0	5
14:30	0	0	0	0	0	0	0	4	0	0	0	0	0	4
14:45	2	1	0	0	0	0	3	3	1	0	0	0	0	4
Hour	8	3	1	0	0	0	12	16	2	0	0	0	0	18
15:00	0	0	0	0	0	0	0	4	0	0	0	0	0	4
15:15	2	0	0	0	0	0	2	5	0	0	0	0	0	5
15:30	3	0	0	0	0	0	3	4	0	0	0	0	0	4
15:45	1	0	0	0	0	0	1	6	0	0	0	0	0	6
Hour	6	0	0	0	0	0	6	19	0	0	0	0	0	19
16:00	0	0	0	0	0	0	0	7	0	0	0	0	0	7
16:15	1	0	0	0	0	0	1	5	0	0	0	0	0	5
16:30	1	0	0	0	0	0	1	3	0	0	0	0	0	3
16:45	1	1	0	0	0	0	2	6	0	0	0	0	0	6
Hour	3	1	0	0	0	0	4	21	0	0	0	0	0	21
17:00	1	0	0	0	0	0	1	2	0	0	0	0	0	2
17:15	1	0	0	0	0	0	1	5	1	0	0	0	0	6
17:30	1	0	0	0	0	0	1	9	0	0	0	0	0	9
17:45	0	0	0	0	0	0	0	6	0	0	0	0	0	6
Hour	3	0	0	0	0	0	3	22	1	0	0	0	0	23
18:00	1	0	0	0	0	0	1	1	0	0	0	0	0	1
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	2	0	0	0	0	0	2	2	0	0	0	0	0	2
18:45	1	0	0	0	0	0	1	5	0	0	0	0	0	5
Hour	4	0	0	0	0	0	4	8	0	0	0	0	0	8
Total	58	9	3	0	0	0	70	163	14	3	0	0	0	180

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	D to B - Howth Rd to Dublin Rd						Veh. Total	D to A - Howth Rd to Station Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	36	2	0	0	1	0	39	19	2	0	0	0	0	21
07:15	43	1	1	0	0	0	45	29	4	1	1	0	0	35
07:30	30	1	2	0	1	0	34	34	1	1	0	0	0	36
07:45	52	4	0	0	0	0	56	30	0	1	0	0	0	31
Hour	161	8	3	0	2	0	174	112	7	3	1	0	0	123
08:00	53	2	0	1	1	0	57	32	6	1	0	0	0	39
08:15	68	4	0	0	0	0	72	40	3	1	1	0	0	45
08:30	114	4	3	0	0	2	123	69	1	0	0	0	0	70
08:45	87	7	1	0	0	0	95	56	3	1	0	1	1	62
Hour	322	17	4	1	1	2	347	197	13	3	1	1	1	216
09:00	83	4	1	1	1	1	91	55	6	2	0	0	0	63
09:15	58	6	1	1	0	0	66	34	6	0	0	0	0	40
09:30	42	6	2	0	0	1	51	33	6	1	1	0	0	41
09:45	45	9	2	1	0	1	58	32	4	1	0	0	0	37
Hour	228	25	6	3	1	3	266	154	22	4	1	0	0	181
10:00	47	7	1	0	1	1	57	37	6	1	0	0	1	45
10:15	44	4	1	0	0	1	50	24	6	1	0	0	0	31
10:30	46	4	4	1	1	0	56	31	9	2	1	0	0	43
10:45	56	7	3	0	0	0	66	27	7	7	0	0	0	41
Hour	193	22	9	1	2	2	229	119	28	11	1	0	1	160
11:00	50	7	3	0	0	0	60	42	7	3	0	0	0	52
11:15	71	6	0	0	0	0	77	39	2	3	0	0	0	44
11:30	41	3	2	0	1	0	47	40	5	2	0	0	0	47
11:45	69	12	2	0	0	1	84	43	12	1	0	0	0	56
Hour	231	28	7	0	1	1	268	164	26	9	0	0	0	199
12:00	72	7	0	0	1	1	81	29	11	0	0	0	0	40
12:15	68	8	1	0	0	0	77	39	12	4	0	0	0	55
12:30	56	9	2	1	1	1	70	41	8	2	0	0	0	51
12:45	50	7	1	0	0	0	58	36	2	2	1	0	0	41
Hour	246	31	4	1	2	2	286	145	33	8	1	0	0	187
13:00	54	10	1	0	1	0	66	37	6	2	1	0	0	46
13:15	47	6	5	0	0	1	59	33	3	0	0	0	0	36
13:30	55	4	0	0	1	0	60	37	8	5	0	0	0	50
13:45	75	5	3	0	0	0	83	35	7	4	1	0	0	47
Hour	231	25	9	0	2	1	268	142	24	11	2	0	0	179
14:00	47	5	3	0	0	2	57	26	6	2	0	0	1	35
14:15	61	9	1	0	0	0	71	44	6	1	0	0	0	51
14:30	51	4	1	1	0	0	57	34	6	3	0	0	0	43
14:45	55	5	2	0	0	0	62	42	8	1	1	0	0	52
Hour	214	23	7	1	0	2	247	146	26	7	1	0	1	181
15:00	58	6	1	0	1	0	66	48	11	2	2	0	0	63
15:15	55	7	0	0	0	0	62	47	13	4	0	0	1	65
15:30	80	15	2	1	1	0	99	46	14	1	1	0	0	62
15:45	84	8	1	0	0	0	93	55	7	0	0	0	0	62
Hour	277	36	4	1	2	0	320	196	45	7	3	0	1	252
16:00	80	4	0	0	2	0	86	56	9	1	1	0	0	67
16:15	69	9	1	0	1	0	80	58	9	0	0	0	0	67
16:30	69	5	1	1	1	0	77	53	8	1	0	1	1	64
16:45	65	5	0	0	0	0	70	44	8	0	0	0	0	52
Hour	283	23	2	1	4	0	313	211	34	2	1	1	1	250
17:00	65	10	0	1	0	1	77	65	4	1	0	0	1	71
17:15	67	4	1	0	1	0	73	39	5	0	0	0	0	44
17:30	64	4	0	0	1	0	69	44	12	0	0	0	0	56
17:45	63	4	0	0	0	0	67	45	6	0	0	0	0	51
Hour	259	22	1	1	2	1	286	193	27	1	0	0	1	222
18:00	73	3	0	1	2	1	80	72	8	0	0	0	0	80
18:15	59	3	1	0	0	0	63	41	3	0	0	0	0	44
18:30	29	2	0	0	1	0	32	39	5	1	0	0	0	45
18:45	35	0	0	0	0	0	35	41	5	1	0	0	0	47
Hour	196	8	1	1	3	1	210	193	21	2	0	0	0	216
Total	2841	268	57	11	22	15	3214	1972	306	68	12	2	6	2366

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	To Arm A - Station Rd						Veh. Total	From Arm A - Station Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	34	3	0	0	0	0	37	34	14	2	1	0	0	51
07:15	53	5	1	1	0	0	60	66	28	3	0	0	0	97
07:30	67	3	1	1	0	0	72	50	23	1	0	0	0	74
07:45	64	2	1	0	0	0	67	71	19	2	1	0	0	93
Hour	218	13	3	2	0	0	236	221	84	8	2	0	0	315
08:00	59	8	1	0	0	0	68	66	6	1	0	2	0	75
08:15	88	4	1	1	1	0	95	113	7	3	1	5	1	130
08:30	100	3	0	0	4	0	107	116	10	2	0	0	0	128
08:45	98	7	4	0	1	1	111	100	19	1	0	2	0	122
Hour	345	22	6	1	6	1	381	395	42	7	1	9	1	455
09:00	110	6	3	0	2	0	121	59	28	4	2	0	1	94
09:15	63	11	0	0	0	0	74	51	18	5	3	0	0	77
09:30	57	11	2	1	0	0	71	47	13	1	1	0	0	62
09:45	54	6	1	1	0	0	62	98	20	3	0	0	0	121
Hour	284	34	6	2	2	0	328	255	79	13	6	0	1	354
10:00	59	13	1	0	0	1	74	64	9	4	0	0	0	77
10:15	42	10	3	0	0	0	55	51	13	5	2	0	1	72
10:30	66	10	3	1	0	0	80	32	9	4	0	0	0	45
10:45	49	10	8	0	0	0	67	77	9	3	0	1	0	90
Hour	216	43	15	1	0	1	276	224	40	16	2	1	1	284
11:00	59	10	5	0	0	1	75	45	12	2	0	0	0	59
11:15	65	7	3	0	1	0	76	51	20	4	1	0	0	76
11:30	63	6	2	1	0	0	72	66	18	0	2	0	0	86
11:45	73	17	1	0	0	0	91	60	15	4	1	0	0	80
Hour	260	40	11	1	1	1	314	222	65	10	4	0	0	301
12:00	64	15	3	0	0	1	83	65	11	2	0	0	0	78
12:15	75	19	5	2	0	0	101	41	6	3	0	0	0	50
12:30	63	13	2	1	0	0	79	83	8	2	0	0	0	93
12:45	75	4	2	1	0	0	82	96	12	3	1	1	0	113
Hour	277	51	12	4	0	1	345	285	37	10	1	1	0	334
13:00	69	10	2	1	1	0	83	79	8	0	0	0	0	87
13:15	64	10	2	0	1	1	78	69	3	3	1	0	0	76
13:30	64	9	6	2	1	0	82	76	6	2	1	0	0	85
13:45	76	10	4	3	0	0	93	80	13	1	1	0	0	95
Hour	273	39	14	6	3	1	336	304	30	6	3	0	0	343
14:00	59	10	2	0	0	1	72	60	10	1	1	0	1	73
14:15	73	8	1	1	0	0	83	75	8	1	2	1	0	87
14:30	77	10	5	0	0	0	92	66	14	0	0	1	0	81
14:45	91	11	4	2	0	0	108	70	6	3	1	2	0	82
Hour	300	39	12	3	0	1	355	271	38	5	4	4	1	323
15:00	78	18	3	3	1	0	103	73	7	4	1	2	0	87
15:15	76	23	5	0	1	1	106	112	8	1	0	0	0	121
15:30	85	22	3	1	1	0	112	69	7	1	0	2	0	79
15:45	95	10	0	1	3	0	109	70	9	3	0	2	1	85
Hour	334	73	11	5	6	1	430	324	31	9	1	6	1	372
16:00	89	12	4	1	1	0	107	81	9	1	1	1	2	95
16:15	91	18	1	0	0	0	110	52	1	0	0	0	1	54
16:30	88	18	1	0	1	1	109	108	5	0	1	0	0	114
16:45	92	13	1	0	1	0	107	92	7	1	0	0	0	100
Hour	360	61	7	1	3	1	433	333	22	2	2	1	3	363
17:00	98	10	1	0	0	1	110	72	5	0	1	0	0	78
17:15	67	10	0	1	0	0	78	79	7	1	0	0	0	87
17:30	72	16	1	0	0	2	91	103	2	0	0	0	0	105
17:45	87	9	1	1	0	0	98	104	2	1	0	0	0	107
Hour	324	45	3	2	0	3	377	358	16	2	1	0	0	377
18:00	113	11	0	2	0	0	126	81	2	1	0	0	1	85
18:15	73	8	0	0	0	0	81	90	4	0	0	0	0	94
18:30	63	7	2	0	0	0	72	84	4	0	0	0	0	88
18:45	82	8	2	0	0	0	92	102	5	0	0	0	0	107
Hour	331	34	4	2	0	0	371	357	15	1	0	0	1	374
Total	3522	494	104	30	21	11	4182	3549	499	89	27	22	9	4195

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	To Arm B - Dublin Rd						Veh. Total	From Arm B - Dublin Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	55	3	0	0	1	0	59	24	1	0	1	1	0	27
07:15	76	1	1	0	1	0	79	39	6	2	0	1	2	50
07:30	55	4	2	0	1	0	62	43	6	0	0	0	0	49
07:45	91	8	0	1	1	1	102	58	11	2	1	0	0	72
Hour	277	16	3	1	4	1	302	164	24	4	2	2	2	198
08:00	94	3	0	1	1	0	99	121	9	1	1	2	0	134
08:15	129	8	0	0	0	0	137	126	9	2	1	0	1	139
08:30	163	5	3	0	2	3	176	109	8	1	0	1	0	119
08:45	136	7	3	0	0	0	146	131	9	3	1	1	0	145
Hour	522	23	6	1	3	3	558	487	35	7	3	4	1	537
09:00	144	11	1	1	3	1	161	70	4	3	0	2	0	79
09:15	92	6	1	1	1	0	101	87	10	2	0	1	0	100
09:30	71	9	5	0	1	1	87	74	11	2	0	0	0	87
09:45	87	11	2	1	0	1	102	67	9	4	1	0	1	82
Hour	394	37	9	3	5	3	451	298	34	11	1	3	1	348
10:00	83	10	2	0	2	2	99	76	10	0	0	2	0	88
10:15	69	6	1	0	0	2	78	62	9	2	0	0	0	73
10:30	84	7	5	1	1	0	98	63	4	3	1	2	2	75
10:45	83	9	3	0	0	0	95	80	11	2	0	1	0	94
Hour	319	32	11	1	3	4	370	281	34	7	1	5	2	330
11:00	78	14	4	0	2	0	98	80	14	1	0	0	0	95
11:15	96	11	0	0	0	0	107	88	9	4	0	1	0	102
11:30	69	9	4	0	1	0	83	82	10	3	2	1	0	98
11:45	97	18	2	0	0	1	118	92	6	0	1	1	0	100
Hour	340	52	10	0	3	1	406	342	39	8	3	3	0	395
12:00	109	10	1	0	2	1	123	87	11	4	0	0	2	104
12:15	106	11	2	0	0	0	119	98	5	3	1	1	0	108
12:30	99	13	5	1	1	1	120	90	7	3	1	0	0	101
12:45	86	9	2	0	0	0	97	100	6	3	1	2	0	112
Hour	400	43	10	1	3	2	459	375	29	13	3	3	2	425
13:00	81	15	1	0	2	0	99	95	11	3	1	0	1	111
13:15	89	10	6	0	0	1	106	110	1	2	0	2	0	115
13:30	101	7	3	0	1	0	112	78	7	3	2	1	1	92
13:45	131	10	3	0	0	0	144	79	11	0	0	3	3	96
Hour	402	42	13	0	3	1	461	362	30	8	3	6	5	414
14:00	83	10	5	0	2	2	102	88	8	2	1	0	1	100
14:15	100	17	3	0	0	1	121	111	6	1	1	1	0	120
14:30	86	7	1	1	1	0	96	88	10	3	0	1	2	104
14:45	107	7	2	0	1	1	118	116	6	0	0	2	1	125
Hour	376	41	11	1	4	4	437	403	30	6	2	4	4	449
15:00	106	6	2	0	2	1	117	91	3	2	0	1	1	98
15:15	92	8	0	1	0	0	101	102	2	1	0	0	1	106
15:30	123	19	3	1	1	0	147	98	7	0	0	2	1	108
15:45	126	11	1	0	0	0	138	107	6	1	1	1	1	117
Hour	447	44	6	2	3	1	503	398	18	4	1	4	4	429
16:00	124	6	0	0	3	1	134	114	7	1	0	1	0	123
16:15	109	16	1	0	3	1	130	95	7	0	0	0	0	102
16:30	103	10	2	1	1	0	117	102	4	0	0	1	1	108
16:45	112	9	1	0	1	0	123	112	5	0	0	0	0	117
Hour	448	41	4	1	8	2	504	423	23	1	0	2	1	450
17:00	107	12	1	1	1	1	123	140	5	0	0	1	1	147
17:15	97	8	1	0	1	0	107	88	3	0	0	1	2	94
17:30	109	6	0	0	1	0	116	117	7	1	0	1	0	126
17:45	85	7	0	0	0	0	92	111	7	0	0	2	1	121
Hour	398	33	2	1	3	1	438	456	22	1	0	5	4	488
18:00	107	5	0	1	3	1	117	94	3	0	0	1	0	98
18:15	90	5	3	0	0	0	98	111	4	0	0	0	1	116
18:30	72	5	0	0	2	0	79	95	5	1	0	2	0	103
18:45	81	1	0	0	0	0	82	89	1	0	0	0	0	90
Hour	350	16	3	1	5	1	376	389	13	1	0	3	1	407
Total	4673	420	88	13	47	24	5265	4378	331	71	19	44	27	4870

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	To Arm C - Greenfield Rd						Veh. Total	From Arm C - Greenfield Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	14	4	0	1	1	0	20	29	2	0	0	0	0	31
07:15	41	16	2	0	0	1	60	52	1	0	0	1	0	54
07:30	48	11	0	0	0	0	59	55	3	0	1	0	0	59
07:45	60	6	1	1	0	0	68	66	5	0	0	1	1	73
Hour	163	37	3	2	1	1	207	202	11	0	1	2	1	217
08:00	125	4	1	1	3	0	134	63	2	0	0	0	0	65
08:15	145	6	3	0	5	1	160	102	4	0	0	1	0	107
08:30	111	5	2	0	1	0	119	73	1	0	0	6	1	81
08:45	69	10	2	1	2	0	84	77	3	4	0	0	0	84
Hour	450	25	8	2	11	1	497	315	10	4	0	7	1	337
09:00	43	6	3	1	1	0	54	109	5	0	0	4	0	118
09:15	59	6	4	0	1	0	70	54	5	0	0	1	0	60
09:30	42	10	1	0	0	0	53	46	9	5	0	1	0	61
09:45	49	12	2	0	0	0	63	57	3	0	1	0	0	61
Hour	193	34	10	1	2	0	240	266	22	5	1	6	0	300
10:00	44	10	1	0	0	0	55	53	7	1	0	1	1	63
10:15	33	4	4	0	0	0	41	41	3	2	0	0	0	46
10:30	26	2	1	1	1	0	31	70	4	2	0	0	0	76
10:45	51	8	3	0	0	0	62	42	4	1	0	0	0	47
Hour	154	24	9	1	1	0	189	206	18	6	0	1	1	232
11:00	38	6	0	0	0	0	44	43	7	2	0	2	1	55
11:15	44	11	3	0	0	0	58	50	8	0	0	1	0	59
11:30	46	6	0	0	1	0	53	43	4	3	1	0	0	51
11:45	46	4	1	1	0	0	52	48	9	0	0	0	0	57
Hour	174	27	4	1	1	0	207	184	28	5	1	3	1	222
12:00	45	6	1	0	0	1	53	63	5	3	0	1	1	73
12:15	41	1	0	0	0	0	42	59	8	2	2	0	0	71
12:30	60	4	1	0	0	0	65	57	9	3	1	0	0	70
12:45	66	4	2	2	2	0	76	67	4	1	0	0	0	72
Hour	212	15	4	2	2	1	236	246	26	9	3	1	1	286
13:00	50	9	0	1	0	0	60	51	9	0	0	2	0	62
13:15	67	2	0	1	0	0	70	68	11	3	0	0	1	83
13:30	81	9	2	0	0	0	92	63	4	4	1	0	0	72
13:45	49	6	0	1	2	3	61	84	5	0	2	0	0	91
Hour	247	26	2	3	2	3	283	266	29	7	3	2	1	308
14:00	53	4	2	1	0	2	62	63	7	2	0	2	0	74
14:15	77	4	1	1	0	0	83	62	8	3	1	0	1	75
14:30	59	5	0	0	2	2	68	75	6	2	0	1	0	84
14:45	67	3	1	1	3	1	76	93	6	3	1	1	1	105
Hour	256	16	4	3	5	5	289	293	27	10	2	4	2	338
15:00	74	3	2	1	2	0	82	73	6	2	1	2	1	85
15:15	103	3	1	0	0	1	108	64	11	1	1	1	0	78
15:30	65	5	0	0	2	1	73	81	12	3	0	0	0	96
15:45	55	3	4	0	3	1	66	77	4	0	1	3	0	85
Hour	297	14	7	1	7	3	329	295	33	6	3	6	1	344
16:00	65	4	0	1	2	2	74	67	4	3	0	2	1	77
16:15	61	2	0	0	0	1	64	70	15	1	0	2	1	89
16:30	76	4	0	1	0	0	81	66	15	1	0	0	0	82
16:45	85	6	0	0	0	0	91	86	10	2	0	2	0	100
Hour	287	16	0	2	2	3	310	289	44	7	0	6	2	348
17:00	62	3	0	1	1	0	67	65	7	1	0	1	0	74
17:15	53	3	0	0	0	1	57	43	8	0	1	0	0	52
17:30	81	3	0	0	0	0	84	57	6	1	0	0	2	66
17:45	79	4	0	0	1	0	84	53	5	1	1	0	0	60
Hour	275	13	0	1	2	1	292	218	26	3	2	1	2	252
18:00	59	1	0	0	0	0	60	63	5	0	2	1	0	71
18:15	61	3	0	0	0	1	65	47	6	2	0	0	0	55
18:30	66	4	1	0	1	0	72	50	4	1	0	1	0	56
18:45	67	0	0	0	0	0	67	71	3	1	0	0	0	75
Hour	253	8	1	0	1	1	264	231	18	4	2	2	0	257
Total	2961	255	52	19	37	19	3343	3011	292	66	18	41	13	3441

Site No. 1
Location Station Rd / Dublin Rd / Greenfield Rd / Howth Rd
Date Tuesday 26 September 2023

Time	To Arm D - Howth Rd						Veh. Total	From Arm D - Howth Rd						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	40	11	2	1	0	0	54	56	4	0	0	1	0	61
07:15	60	18	3	0	1	1	83	73	5	2	1	0	0	81
07:30	42	16	1	0	0	0	59	64	2	3	0	1	0	70
07:45	62	23	3	0	0	0	88	82	4	1	0	0	0	87
Hour	204	68	9	1	1	1	284	275	15	6	1	2	0	299
08:00	58	10	1	0	1	0	70	86	8	1	1	1	0	97
08:15	88	10	2	2	0	1	103	109	8	1	1	0	0	119
08:30	109	11	1	0	0	0	121	185	5	3	0	0	2	195
08:45	152	17	1	0	1	0	171	147	10	2	0	1	1	161
Hour	407	48	5	2	2	1	465	527	31	7	2	2	3	572
09:00	82	24	3	1	1	1	112	141	10	3	1	1	1	157
09:15	72	23	4	3	0	0	102	94	13	2	1	0	0	110
09:30	73	16	3	1	0	0	93	76	13	3	1	0	1	94
09:45	112	17	5	1	0	1	136	80	14	3	1	0	1	99
Hour	339	80	15	6	1	2	443	391	50	11	4	1	3	460
10:00	92	9	3	0	2	0	106	85	16	2	0	1	2	106
10:15	82	15	4	2	0	0	103	72	10	3	0	0	1	86
10:30	68	11	6	0	1	2	88	79	13	6	2	1	0	101
10:45	105	13	2	0	2	0	122	89	16	10	0	0	0	115
Hour	347	48	15	2	5	2	419	325	55	21	2	2	3	408
11:00	87	17	2	0	0	0	106	94	14	6	0	0	0	114
11:15	95	16	5	1	1	0	118	111	8	3	0	0	0	122
11:30	96	19	4	4	0	0	123	83	8	4	0	1	0	96
11:45	97	15	4	1	1	0	118	113	24	4	0	0	1	142
Hour	375	67	15	6	2	0	465	401	54	17	0	1	1	474
12:00	102	15	4	0	0	1	122	105	19	0	0	1	1	126
12:15	87	8	6	1	1	0	103	111	20	5	0	0	0	136
12:30	108	12	4	1	0	0	125	100	18	4	1	1	1	125
12:45	127	14	4	0	1	0	146	91	9	3	1	0	0	104
Hour	424	49	18	2	2	1	496	407	66	12	2	2	2	491
13:00	118	10	3	0	0	1	132	93	16	3	1	1	0	114
13:15	111	2	5	0	1	0	119	84	9	5	0	0	1	99
13:30	76	4	3	2	0	1	86	105	12	5	0	1	0	123
13:45	101	15	1	0	1	0	118	114	12	7	1	0	0	134
Hour	406	31	12	2	2	2	455	396	49	20	2	2	1	470
14:00	94	12	1	1	0	0	108	78	11	5	0	0	3	97
14:15	107	9	2	2	2	0	122	109	16	2	0	0	0	127
14:30	96	18	3	0	0	0	117	89	10	4	1	0	0	104
14:45	114	11	2	0	1	0	128	100	14	3	1	0	0	118
Hour	411	50	8	3	3	0	475	376	51	14	2	0	3	446
15:00	89	6	4	0	1	1	101	110	17	3	2	1	0	133
15:15	114	7	1	0	0	0	122	107	20	4	0	0	1	132
15:30	105	9	1	0	1	0	116	130	29	3	2	1	0	165
15:45	123	10	0	1	0	1	135	145	15	1	0	0	0	161
Hour	431	32	6	1	2	2	474	492	81	11	4	2	1	591
16:00	127	11	2	0	0	0	140	143	13	1	1	2	0	160
16:15	88	5	0	0	0	0	93	132	18	1	0	1	0	152
16:30	134	5	0	0	1	1	141	125	13	2	1	2	1	144
16:45	116	7	1	0	0	0	124	115	13	0	0	0	0	128
Hour	465	28	3	0	1	1	498	515	57	4	2	5	1	584
17:00	142	6	0	0	0	1	149	132	14	1	1	0	2	150
17:15	104	7	1	0	1	1	114	111	10	1	0	1	0	123
17:30	132	6	1	0	1	0	140	117	16	0	0	1	0	134
17:45	131	4	1	0	1	1	138	114	10	0	0	0	0	124
Hour	509	23	3	0	3	3	541	474	50	2	1	2	2	531
18:00	105	4	1	0	1	1	112	146	11	0	1	2	1	161
18:15	124	4	0	0	0	0	128	100	6	1	0	0	0	107
18:30	98	4	0	0	1	0	103	70	7	1	0	1	0	79
18:45	113	5	0	0	0	0	118	81	5	1	0	0	0	87
Hour	440	17	1	0	2	1	461	397	29	3	1	3	1	434
Total	4758	541	110	25	26	16	5476	4976	588	128	23	24	21	5760

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	A to D - Church Rd(N) to Howth Rd(E)						Veh. Total	A to C - Church Rd(N) to Church Rd(S)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	A to B - Church Rd(N) to Howth Rd(W)						Veh. Total	B to A - Howth Rd(W) to Church Rd(N)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Hour	0	0	0	0	0	0	0	0	0	1	0	0	0	1
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	1	0	0	0	0	1	0	1	0	0	0	0	1
Hour	0	1	0	0	0	0	1	0	1	0	0	0	0	1
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1	0	1	1	0	0	0	2

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	B to D - Howth Rd(W) to Howth Rd(E)						Veh. Total	B to C - Howth Rd(W) to Church Rd(S)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	36	11	2	1	0	0	50	2	1	0	0	0	0	3
07:15	47	16	3	0	1	1	68	5	0	0	0	0	0	5
07:30	29	19	1	0	0	0	49	5	0	0	0	0	0	5
07:45	46	16	3	0	0	0	65	7	0	0	0	0	0	7
Hour	158	62	9	1	1	1	232	19	1	0	0	0	0	20
08:00	42	13	1	0	1	0	57	20	0	0	0	0	0	20
08:15	43	12	2	2	0	1	60	40	0	0	0	0	0	40
08:30	92	13	1	0	0	0	106	30	0	0	0	0	0	30
08:45	115	18	1	0	1	0	135	20	1	0	0	0	0	21
Hour	292	56	5	2	2	1	358	110	1	0	0	0	0	111
09:00	60	15	2	0	0	0	77	6	0	0	0	0	0	6
09:15	56	21	5	4	1	0	87	12	0	1	0	0	0	13
09:30	66	17	3	1	0	0	87	6	2	0	0	0	0	8
09:45	88	18	6	1	0	0	113	9	0	0	0	0	0	9
Hour	270	71	16	6	1	0	364	33	2	1	0	0	0	36
10:00	75	7	3	0	2	0	87	12	0	0	0	0	0	12
10:15	72	14	3	2	0	0	91	13	0	0	0	0	0	13
10:30	64	15	8	0	0	2	89	12	3	0	0	0	0	15
10:45	80	10	2	0	2	0	94	9	1	0	0	0	0	10
Hour	291	46	16	2	4	2	361	46	4	0	0	0	0	50
11:00	79	17	1	0	0	0	97	9	2	0	0	1	0	12
11:15	74	17	4	1	1	0	97	13	0	0	0	0	0	13
11:30	61	15	3	3	0	0	82	7	0	0	0	0	0	7
11:45	87	10	1	2	1	0	101	17	0	1	0	0	0	18
Hour	301	59	9	6	2	0	377	46	2	1	0	1	0	50
12:00	72	14	3	0	0	0	89	8	0	0	0	0	0	8
12:15	114	13	8	1	1	0	137	16	0	0	0	0	0	16
12:30	96	9	4	1	0	0	110	19	0	0	0	0	0	19
12:45	97	9	3	0	0	0	109	14	0	0	0	0	0	14
Hour	379	45	18	2	1	0	445	57	0	0	0	0	0	57
13:00	85	6	3	0	1	1	96	20	0	0	0	0	0	20
13:15	107	7	7	0	0	0	121	33	1	0	0	0	0	34
13:30	77	4	1	2	1	1	86	8	2	1	0	0	0	11
13:45	77	10	1	0	0	0	88	21	1	0	0	0	0	22
Hour	346	27	12	2	2	2	391	82	4	1	0	0	0	87
14:00	110	12	1	1	1	0	125	16	1	0	0	0	0	17
14:15	83	7	0	1	2	0	93	26	0	0	0	0	0	26
14:30	90	18	3	1	0	0	112	14	0	1	0	0	0	15
14:45	98	8	2	0	1	0	109	20	0	0	0	0	0	20
Hour	381	45	6	3	4	0	439	76	1	1	0	0	0	78
15:00	79	7	3	0	1	1	91	19	0	0	0	0	0	19
15:15	98	5	1	0	0	0	104	33	0	0	0	0	0	33
15:30	86	8	1	0	1	0	96	26	1	0	0	0	0	27
15:45	91	8	0	1	0	1	101	17	0	0	0	0	0	17
Hour	354	28	5	1	2	2	392	95	1	0	0	0	0	96
16:00	114	10	2	0	0	0	126	22	0	0	0	0	0	22
16:15	84	6	0	0	0	0	90	19	0	0	0	0	0	19
16:30	99	6	0	0	1	1	107	29	0	0	0	0	0	29
16:45	99	5	1	0	0	0	105	24	2	0	0	0	0	26
Hour	396	27	3	0	1	1	428	94	2	0	0	0	0	96
17:00	119	5	0	0	0	1	125	27	1	0	0	0	0	28
17:15	98	5	1	0	1	0	105	27	0	0	0	0	0	27
17:30	117	4	1	0	1	1	124	22	0	0	0	0	0	22
17:45	116	6	0	0	1	0	123	25	1	1	0	0	0	27
Hour	450	20	2	0	3	2	477	101	2	1	0	0	0	104
18:00	108	4	1	0	1	2	116	18	0	0	0	0	0	18
18:15	114	5	0	0	0	0	119	15	2	0	0	0	0	17
18:30	103	0	0	0	1	0	104	14	0	0	0	0	0	14
18:45	84	5	0	0	0	0	89	16	0	0	0	0	0	16
Hour	409	14	1	0	2	2	428	63	2	0	0	0	0	65
Total	4027	500	102	25	25	13	4692	822	22	5	0	1	0	850

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	C to B - Church Rd(S) to Howth Rd(W)						Veh. Total	C to A - Church Rd(S) to Church Rd(N)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	2	0	0	0	0	0	2	0	0	0	0	0	0	0
07:15	5	2	0	0	0	0	7	0	0	0	0	0	0	0
07:30	4	1	0	0	0	0	5	0	0	0	0	0	0	0
07:45	9	1	0	0	0	0	10	0	0	0	0	0	0	0
Hour	20	4	0	0	0	0	24	0	0	0	0	0	0	0
08:00	12	0	0	0	0	0	12	0	0	0	0	0	0	0
08:15	42	0	0	0	0	0	42	0	0	0	0	0	0	0
08:30	96	0	0	0	1	0	97	0	0	0	0	0	0	0
08:45	65	2	2	0	0	0	69	0	0	0	0	0	0	0
Hour	215	2	2	0	1	0	220	0	0	0	0	0	0	0
09:00	42	0	0	0	0	0	42	0	0	0	0	0	0	0
09:15	12	0	0	0	0	0	12	0	0	0	0	0	0	0
09:30	4	1	0	0	0	0	5	0	0	0	0	0	0	0
09:45	11	0	0	0	0	0	11	0	0	0	0	0	0	0
Hour	69	1	0	0	0	0	70	0	0	0	0	0	0	0
10:00	13	2	0	0	0	0	15	0	0	0	0	0	0	0
10:15	12	0	0	0	0	0	12	0	0	0	0	0	0	0
10:30	9	1	0	0	0	0	10	0	0	1	0	0	0	1
10:45	17	2	0	0	0	0	19	0	0	0	0	0	0	0
Hour	51	5	0	0	0	0	56	0	0	1	0	0	0	1
11:00	16	0	0	0	0	0	16	0	0	0	0	0	0	0
11:15	8	1	0	0	0	0	9	0	0	0	0	0	0	0
11:30	11	1	0	0	0	0	12	0	0	0	0	0	0	0
11:45	13	0	0	0	0	0	13	0	0	0	0	0	0	0
Hour	48	2	0	0	0	0	50	0	0	0	0	0	0	0
12:00	13	1	0	0	0	0	14	0	0	0	1	0	0	1
12:15	12	0	0	0	0	0	12	0	0	0	0	0	0	0
12:30	10	0	0	0	0	0	10	0	0	0	0	0	0	0
12:45	12	0	0	0	0	0	12	0	0	0	0	0	0	0
Hour	47	1	0	0	0	0	48	0	0	0	1	0	0	1
13:00	11	1	0	0	0	0	12	0	0	0	0	0	0	0
13:15	13	2	0	0	0	0	15	0	0	0	0	0	0	0
13:30	17	2	0	0	0	0	19	0	0	0	0	0	0	0
13:45	12	0	0	0	0	0	12	0	0	0	0	0	0	0
Hour	53	5	0	0	0	0	58	0	0	0	0	0	0	0
14:00	9	0	0	0	0	0	9	0	0	0	0	0	0	0
14:15	15	1	0	0	0	0	16	0	0	0	0	0	0	0
14:30	30	0	0	0	0	0	30	0	0	0	0	0	0	0
14:45	13	0	0	0	0	0	13	0	0	0	0	0	0	0
Hour	67	1	0	0	0	0	68	0	0	0	0	0	0	0
15:00	16	0	0	0	0	0	16	0	0	0	0	0	0	0
15:15	9	0	0	0	0	0	9	0	0	0	0	0	0	0
15:30	40	1	0	0	0	0	41	0	0	0	0	0	0	0
15:45	50	1	0	0	2	0	53	0	0	0	0	0	0	0
Hour	115	2	0	0	2	0	119	0	0	0	0	0	0	0
16:00	30	2	1	0	0	0	33	0	0	0	0	0	0	0
16:15	22	1	0	0	0	0	23	0	0	0	0	0	0	0
16:30	33	1	0	0	1	0	35	0	0	0	0	0	0	0
16:45	26	3	0	0	0	0	29	0	0	0	0	0	0	0
Hour	111	7	1	0	1	0	120	0	0	0	0	0	0	0
17:00	16	0	0	0	0	0	16	0	0	0	0	0	0	0
17:15	14	0	0	0	0	0	14	0	0	0	0	0	0	0
17:30	17	0	0	0	0	0	17	0	0	0	0	0	0	0
17:45	11	0	0	0	0	0	11	0	0	0	0	0	0	0
Hour	58	0	0	0	0	0	58	0	0	0	0	0	0	0
18:00	14	1	0	0	0	0	15	0	0	0	0	0	0	0
18:15	8	0	0	0	0	0	8	0	0	0	0	0	0	0
18:30	12	0	0	0	0	0	12	0	0	0	0	0	0	0
18:45	9	1	0	0	0	0	10	0	0	0	0	0	0	0
Hour	43	2	0	0	0	0	45	0	0	0	0	0	0	0
Total	897	32	3	0	4	0	936	0	0	1	1	0	0	2

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	C to D - Church Rd(S) to Howth Rd(E)						Veh. Total	D to C - Howth Rd(E) to Church Rd(S)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	1	0	0	0	0	1	1	0	0	0	0	0	1
07:15	1	0	0	0	0	0	1	1	0	0	0	0	0	1
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Hour	1	1	0	0	0	0	2	4	0	0	0	0	0	4
08:00	1	0	0	0	0	0	1	2	0	0	0	0	0	2
08:15	2	0	0	0	0	0	2	4	0	0	0	0	0	4
08:30	4	0	0	0	0	0	4	12	1	0	0	0	0	13
08:45	4	0	0	0	0	0	4	4	0	0	0	0	0	4
Hour	11	0	0	0	0	0	11	22	1	0	0	0	0	23
09:00	1	0	0	0	0	0	1	3	0	0	0	0	0	3
09:15	1	0	0	0	0	0	1	1	0	1	0	0	0	2
09:30	2	1	0	0	0	0	3	1	0	0	0	0	0	1
09:45	2	0	0	0	0	0	2	3	0	0	0	0	0	3
Hour	6	1	0	0	0	0	7	8	0	1	0	0	0	9
10:00	0	0	0	0	0	0	0	2	0	0	0	0	0	2
10:15	1	0	0	0	0	0	1	3	0	0	0	0	0	3
10:30	3	0	0	0	0	0	3	1	0	0	0	0	0	1
10:45	0	2	0	0	0	0	2	1	0	0	0	0	0	1
Hour	4	2	0	0	0	0	6	7	0	0	0	0	0	7
11:00	0	0	0	0	0	0	0	3	0	0	0	0	0	3
11:15	0	1	0	0	0	0	1	4	0	0	0	0	0	4
11:30	3	0	0	0	0	0	3	2	0	0	0	0	0	2
11:45	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Hour	3	2	0	0	0	0	5	9	0	0	0	0	0	9
12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	3	0	0	0	0	0	3
12:30	3	0	0	0	0	0	3	2	0	0	0	0	0	2
12:45	1	0	0	0	0	0	1	1	0	0	0	0	0	1
Hour	4	0	0	0	0	0	4	6	0	0	0	0	0	6
13:00	2	0	0	0	0	0	2	5	0	0	0	0	0	5
13:15	1	0	0	0	0	0	1	1	1	0	0	0	0	2
13:30	1	0	0	0	0	0	1	2	0	0	0	0	0	2
13:45	1	0	0	0	0	0	1	1	0	0	0	0	0	1
Hour	5	0	0	0	0	0	5	9	1	0	0	0	0	10
14:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1
14:15	0	0	0	0	0	0	0	0	1	0	0	0	0	1
14:30	0	0	0	0	0	0	0	1	0	0	0	1	0	2
14:45	2	0	0	0	0	0	2	1	0	0	0	0	0	1
Hour	2	0	0	0	0	0	2	3	1	0	0	1	0	5
15:00	1	0	0	0	0	0	1	2	0	0	0	0	0	2
15:15	1	0	0	0	0	0	1	2	0	0	0	0	0	2
15:30	2	0	0	0	0	0	2	5	0	0	0	0	0	5
15:45	3	0	0	0	0	0	3	5	0	0	0	0	0	5
Hour	7	0	0	0	0	0	7	14	0	0	0	0	0	14
16:00	3	0	0	0	0	0	3	3	0	0	0	0	0	3
16:15	1	0	0	0	0	0	1	3	1	0	0	0	0	4
16:30	2	0	0	0	0	0	2	0	0	0	0	0	0	0
16:45	1	0	0	0	0	0	1	2	0	0	0	0	0	2
Hour	7	0	0	0	0	0	7	8	1	0	0	0	0	9
17:00	2	0	0	0	0	0	2	3	0	0	0	0	0	3
17:15	2	0	0	0	0	0	2	1	0	0	0	0	0	1
17:30	2	0	0	0	0	0	2	0	0	0	0	0	0	0
17:45	1	0	0	0	0	0	1	5	0	0	0	0	0	5
Hour	7	0	0	0	0	0	7	9	0	0	0	0	0	9
18:00	1	0	0	0	0	0	1	1	0	0	0	0	0	1
18:15	0	0	0	0	0	0	0	1	0	0	0	0	0	1
18:30	2	0	0	0	0	0	2	0	1	0	0	0	0	1
18:45	1	0	0	0	0	0	1	1	0	0	0	0	0	1
Hour	4	0	0	0	0	0	4	3	1	0	0	0	0	4
Total	61	6	0	0	0	0	67	102	5	1	0	1	0	109

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	D to B - Howth Rd(E) to Howth Rd(W)						Veh. Total	D to A - Howth Rd(E) to Church Rd(N)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	51	4	0	0	1	0	56	0	0	0	0	0	0	0
07:15	71	4	3	1	0	0	79	0	0	0	0	0	0	0
07:30	52	5	2	0	1	0	60	0	0	0	0	0	0	0
07:45	75	4	1	0	0	0	80	0	0	0	0	0	0	0
Hour	249	17	6	1	2	0	275	0	0	0	0	0	0	0
08:00	95	5	2	2	1	0	105	0	0	0	0	0	0	0
08:15	84	5	0	0	0	0	89	0	0	0	0	0	0	0
08:30	104	4	3	0	0	1	112	0	0	0	0	0	0	0
08:45	89	9	0	0	0	1	99	0	0	0	0	0	0	0
Hour	372	23	5	2	1	2	405	0	0	0	0	0	0	0
09:00	117	9	2	1	1	1	131	0	0	0	0	0	0	0
09:15	78	14	1	1	0	0	94	0	0	0	0	0	0	0
09:30	68	9	2	1	0	2	82	0	0	0	0	0	0	0
09:45	75	11	2	1	0	0	89	0	0	0	0	0	0	0
Hour	338	43	7	4	1	3	396	0	0	0	0	0	0	0
10:00	77	15	1	0	1	1	95	0	0	0	0	0	0	0
10:15	62	10	4	0	0	1	77	0	0	0	0	0	0	0
10:30	63	8	3	2	1	0	77	0	0	0	0	0	0	0
10:45	63	13	10	0	0	0	86	0	0	0	0	0	0	0
Hour	265	46	18	2	2	2	335	0	0	0	0	0	0	0
11:00	81	10	6	0	0	0	97	0	0	0	0	0	0	0
11:15	84	7	3	0	0	0	94	0	0	0	0	0	0	0
11:30	74	14	3	0	1	0	92	0	0	0	0	0	0	0
11:45	92	13	1	0	0	1	107	0	0	0	0	0	0	0
Hour	331	44	13	0	1	1	390	0	0	0	0	0	0	0
12:00	90	18	1	0	1	0	110	0	0	0	0	0	0	0
12:15	80	15	5	0	0	0	100	0	0	0	0	0	0	0
12:30	76	13	4	1	1	0	95	0	0	0	0	0	0	0
12:45	66	9	2	1	0	0	78	0	0	0	0	0	0	0
Hour	312	55	12	2	2	0	383	0	0	0	0	0	0	0
13:00	90	13	3	1	1	0	108	0	0	0	0	0	0	0
13:15	57	4	4	0	0	1	66	0	0	0	0	0	0	0
13:30	80	7	4	0	1	0	92	0	0	0	0	0	0	0
13:45	111	15	8	1	0	0	135	0	0	0	0	0	0	0
Hour	338	39	19	2	2	1	401	0	0	0	0	0	0	0
14:00	65	8	4	0	0	3	80	0	0	0	0	0	0	0
14:15	97	15	1	0	0	0	113	0	0	0	0	0	0	0
14:30	71	6	3	1	0	0	81	0	0	0	0	0	0	0
14:45	95	10	2	1	0	2	110	0	0	0	0	0	0	0
Hour	328	39	10	2	0	5	384	0	0	0	0	0	0	0
15:00	83	14	3	2	1	1	104	0	0	0	0	0	0	0
15:15	89	17	2	0	0	0	108	0	0	0	0	0	0	0
15:30	98	19	2	1	1	0	121	0	0	0	0	0	0	0
15:45	101	14	2	0	0	0	117	0	0	0	0	0	0	0
Hour	371	64	9	3	2	1	450	0	0	0	0	0	0	0
16:00	100	13	1	1	1	0	116	0	0	0	0	0	0	0
16:15	82	18	0	1	0	0	101	0	0	0	0	0	0	0
16:30	94	11	2	0	1	1	109	0	0	0	0	0	0	0
16:45	109	12	0	0	0	0	121	0	0	0	0	0	0	0
Hour	385	54	3	2	2	1	447	0	0	0	0	0	0	0
17:00	100	12	2	1	0	1	116	0	0	0	0	0	0	0
17:15	78	12	1	0	1	0	92	0	0	0	0	0	0	0
17:30	90	11	0	0	1	0	102	0	0	0	0	0	0	0
17:45	84	8	0	0	0	0	92	0	0	0	0	0	0	0
Hour	352	43	3	1	2	1	402	0	0	0	0	0	0	0
18:00	115	14	0	1	2	2	134	0	0	0	0	0	0	0
18:15	75	5	2	0	0	0	82	0	0	0	0	0	0	0
18:30	55	5	0	0	1	0	61	0	0	0	0	0	0	0
18:45	67	6	1	0	0	0	74	0	0	0	0	0	0	0
Hour	312	30	3	1	3	2	351	0	0	0	0	0	0	0
Total	3953	497	108	22	20	19	4619	0	0	0	0	0	0	0

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm A - Church Rd(N)						Veh. Total	From Arm A - Church Rd(N)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	1	0	0	0	1	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	1	0	0	0	1	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00	0	0	0	1	0	0	1	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Hour	0	0	1	1	0	0	2	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	1	0	0	0	0	1	0	1	0	0	0	0	1
Hour	0	1	0	0	0	0	1	0	1	0	0	0	0	1
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	2	1	0	0	4	0	1	0	0	0	0	1

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm B - Howth Rd(W)						Veh. Total	From Arm B - Howth Rd(W)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	53	4	0	0	1	0	58	38	12	2	1	0	0	53
07:15	76	6	3	1	0	0	86	52	16	3	0	1	1	73
07:30	56	6	2	0	1	0	65	34	19	1	0	0	0	54
07:45	84	5	1	0	0	0	90	53	16	3	0	0	0	72
Hour	269	21	6	1	2	0	299	177	63	9	1	1	1	252
08:00	107	5	2	2	1	0	117	62	13	1	0	1	0	77
08:15	126	5	0	0	0	0	131	83	12	2	2	0	1	100
08:30	200	4	3	0	1	1	209	122	13	1	0	0	0	136
08:45	154	11	2	0	0	1	168	135	19	1	0	1	0	156
Hour	587	25	7	2	2	2	625	402	57	5	2	2	1	469
09:00	159	9	2	1	1	1	173	66	15	2	0	0	0	83
09:15	90	14	1	1	0	0	106	68	21	6	4	1	0	100
09:30	72	10	2	1	0	2	87	72	19	3	1	0	0	95
09:45	86	11	2	1	0	0	100	97	18	6	1	0	0	122
Hour	407	44	7	4	1	3	466	303	73	17	6	1	0	400
10:00	90	17	1	0	1	1	110	87	7	3	0	2	0	99
10:15	74	10	4	0	0	1	89	85	14	3	2	0	0	104
10:30	72	9	3	2	1	0	87	76	18	8	0	0	2	104
10:45	80	15	10	0	0	0	105	89	11	2	0	2	0	104
Hour	316	51	18	2	2	2	391	337	50	16	2	4	2	411
11:00	97	10	6	0	0	0	113	88	19	1	0	1	0	109
11:15	92	8	3	0	0	0	103	87	17	4	1	1	0	110
11:30	85	15	3	0	1	0	104	68	15	3	3	0	0	89
11:45	105	13	1	0	0	1	120	104	10	2	2	1	0	119
Hour	379	46	13	0	1	1	440	347	61	10	6	3	0	427
12:00	103	19	1	0	1	0	124	80	14	3	0	0	0	97
12:15	92	15	5	0	0	0	112	130	13	8	1	1	0	153
12:30	86	13	4	1	1	0	105	115	9	4	1	0	0	129
12:45	78	9	2	1	0	0	90	111	9	4	0	0	0	124
Hour	359	56	12	2	2	0	431	436	45	19	2	1	0	503
13:00	101	14	3	1	1	0	120	105	6	3	0	1	1	116
13:15	70	6	4	0	0	1	81	140	8	7	0	0	0	155
13:30	97	9	4	0	1	0	111	85	6	2	2	1	1	97
13:45	123	15	8	1	0	0	147	98	11	1	0	0	0	110
Hour	391	44	19	2	2	1	459	428	31	13	2	2	2	478
14:00	74	8	4	0	0	3	89	126	13	1	1	1	0	142
14:15	112	16	1	0	0	0	129	109	7	0	1	2	0	119
14:30	101	6	3	1	0	0	111	104	18	4	1	0	0	127
14:45	108	11	2	1	0	2	124	118	9	2	0	1	0	130
Hour	395	41	10	2	0	5	453	457	47	7	3	4	0	518
15:00	99	14	3	2	1	1	120	98	7	3	0	1	1	110
15:15	98	17	2	0	0	0	117	131	5	1	0	0	0	137
15:30	138	20	2	1	1	0	162	112	9	1	0	1	0	123
15:45	151	15	2	0	2	0	170	108	8	0	1	0	1	118
Hour	486	66	9	3	4	1	569	449	29	5	1	2	2	488
16:00	130	15	2	1	1	0	149	136	10	2	0	0	0	148
16:15	104	19	0	1	0	0	124	103	6	0	0	0	0	109
16:30	127	12	2	0	2	1	144	128	6	0	0	1	1	136
16:45	135	15	0	0	0	0	150	123	7	1	0	0	0	131
Hour	496	61	4	2	3	1	567	490	29	3	0	1	1	524
17:00	116	12	2	1	0	1	132	146	6	0	0	0	1	153
17:15	92	12	1	0	1	0	106	125	5	1	0	1	0	132
17:30	107	11	0	0	1	0	119	139	4	1	0	1	1	146
17:45	95	8	0	0	0	0	103	141	7	1	0	1	0	150
Hour	410	43	3	1	2	1	460	551	22	3	0	3	2	581
18:00	129	15	0	1	2	2	149	126	4	1	0	1	2	134
18:15	83	5	2	0	0	0	90	129	7	0	0	0	0	136
18:30	67	5	0	0	1	0	73	117	0	0	0	1	0	118
18:45	76	7	1	0	0	0	84	100	5	0	0	0	0	105
Hour	355	32	3	1	3	2	396	472	16	1	0	2	2	493
Total	4850	530	111	22	24	19	5556	4849	523	108	25	26	13	5544

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm C - Church Rd(S)						Veh. Total	From Arm C - Church Rd(S)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	3	1	0	0	0	0	4	2	1	0	0	0	0	3
07:15	6	0	0	0	0	0	6	6	2	0	0	0	0	8
07:30	5	0	0	0	0	0	5	4	1	0	0	0	0	5
07:45	9	0	0	0	0	0	9	9	1	0	0	0	0	10
Hour	23	1	0	0	0	0	24	21	5	0	0	0	0	26
08:00	22	0	0	0	0	0	22	13	0	0	0	0	0	13
08:15	44	0	0	0	0	0	44	44	0	0	0	0	0	44
08:30	42	1	0	0	0	0	43	100	0	0	0	1	0	101
08:45	24	1	0	0	0	0	25	69	2	2	0	0	0	73
Hour	132	2	0	0	0	0	134	226	2	2	0	1	0	231
09:00	9	0	0	0	0	0	9	43	0	0	0	0	0	43
09:15	13	0	2	0	0	0	15	13	0	0	0	0	0	13
09:30	7	2	0	0	0	0	9	6	2	0	0	0	0	8
09:45	12	0	0	0	0	0	12	13	0	0	0	0	0	13
Hour	41	2	2	0	0	0	45	75	2	0	0	0	0	77
10:00	14	0	0	0	0	0	14	13	2	0	0	0	0	15
10:15	16	0	0	0	0	0	16	13	0	0	0	0	0	13
10:30	13	3	0	0	0	0	16	12	1	1	0	0	0	14
10:45	10	1	0	0	0	0	11	17	4	0	0	0	0	21
Hour	53	4	0	0	0	0	57	55	7	1	0	0	0	63
11:00	12	2	0	0	1	0	15	16	0	0	0	0	0	16
11:15	17	0	0	0	0	0	17	8	2	0	0	0	0	10
11:30	9	0	0	0	0	0	9	14	1	0	0	0	0	15
11:45	17	0	1	0	0	0	18	13	1	0	0	0	0	14
Hour	55	2	1	0	1	0	59	51	4	0	0	0	0	55
12:00	8	0	0	0	0	0	8	13	1	0	1	0	0	15
12:15	19	0	0	0	0	0	19	12	0	0	0	0	0	12
12:30	21	0	0	0	0	0	21	13	0	0	0	0	0	13
12:45	15	0	0	0	0	0	15	13	0	0	0	0	0	13
Hour	63	0	0	0	0	0	63	51	1	0	1	0	0	53
13:00	25	0	0	0	0	0	25	13	1	0	0	0	0	14
13:15	34	2	0	0	0	0	36	14	2	0	0	0	0	16
13:30	10	2	1	0	0	0	13	18	2	0	0	0	0	20
13:45	22	1	0	0	0	0	23	13	0	0	0	0	0	13
Hour	91	5	1	0	0	0	97	58	5	0	0	0	0	63
14:00	17	1	0	0	0	0	18	9	0	0	0	0	0	9
14:15	26	1	0	0	0	0	27	15	1	0	0	0	0	16
14:30	15	0	1	0	1	0	17	30	0	0	0	0	0	30
14:45	21	0	0	0	0	0	21	15	0	0	0	0	0	15
Hour	79	2	1	0	1	0	83	69	1	0	0	0	0	70
15:00	21	0	0	0	0	0	21	17	0	0	0	0	0	17
15:15	35	0	0	0	0	0	35	10	0	0	0	0	0	10
15:30	31	1	0	0	0	0	32	42	1	0	0	0	0	43
15:45	22	0	0	0	0	0	22	53	1	0	0	2	0	56
Hour	109	1	0	0	0	0	110	122	2	0	0	2	0	126
16:00	25	0	0	0	0	0	25	33	2	1	0	0	0	36
16:15	22	1	0	0	0	0	23	23	1	0	0	0	0	24
16:30	29	0	0	0	0	0	29	35	1	0	0	1	0	37
16:45	26	2	0	0	0	0	28	27	3	0	0	0	0	30
Hour	102	3	0	0	0	0	105	118	7	1	0	1	0	127
17:00	30	1	0	0	0	0	31	18	0	0	0	0	0	18
17:15	28	0	0	0	0	0	28	16	0	0	0	0	0	16
17:30	22	0	0	0	0	0	22	19	0	0	0	0	0	19
17:45	30	1	1	0	0	0	32	12	0	0	0	0	0	12
Hour	110	2	1	0	0	0	113	65	0	0	0	0	0	65
18:00	19	0	0	0	0	0	19	15	1	0	0	0	0	16
18:15	16	2	0	0	0	0	18	8	0	0	0	0	0	8
18:30	14	1	0	0	0	0	15	14	0	0	0	0	0	14
18:45	17	0	0	0	0	0	17	10	1	0	0	0	0	11
Hour	66	3	0	0	0	0	69	47	2	0	0	0	0	49
Total	924	27	6	0	2	0	959	958	38	4	1	4	0	1005

Site No. 2
Location Church Rd(N) / Howth Rd(W) / Church Rd(S) / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm D - Howth Rd(E)						Veh. Total	From Arm D - Howth Rd(E)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	36	12	2	1	0	0	51	52	4	0	0	1	0	57
07:15	48	16	3	0	1	1	69	72	4	3	1	0	0	80
07:30	29	19	1	0	0	0	49	52	5	2	0	1	0	60
07:45	46	16	3	0	0	0	65	77	4	1	0	0	0	82
Hour	159	63	9	1	1	1	234	253	17	6	1	2	0	279
08:00	43	13	1	0	1	0	58	97	5	2	2	1	0	107
08:15	45	12	2	2	0	1	62	88	5	0	0	0	0	93
08:30	96	13	1	0	0	0	110	116	5	3	0	0	1	125
08:45	119	18	1	0	1	0	139	93	9	0	0	0	1	103
Hour	303	56	5	2	2	1	369	394	24	5	2	1	2	428
09:00	61	15	2	0	0	0	78	120	9	2	1	1	1	134
09:15	57	21	5	4	1	0	88	79	14	2	1	0	0	96
09:30	68	18	3	1	0	0	90	69	9	2	1	0	2	83
09:45	90	18	6	1	0	0	115	78	11	2	1	0	0	92
Hour	276	72	16	6	1	0	371	346	43	8	4	1	3	405
10:00	75	7	3	0	2	0	87	79	15	1	0	1	1	97
10:15	73	14	3	2	0	0	92	65	10	4	0	0	1	80
10:30	67	15	8	0	0	2	92	64	8	3	2	1	0	78
10:45	80	12	2	0	2	0	96	64	13	10	0	0	0	87
Hour	295	48	16	2	4	2	367	272	46	18	2	2	2	342
11:00	79	17	1	0	0	0	97	84	10	6	0	0	0	100
11:15	74	18	4	1	1	0	98	88	7	3	0	0	0	98
11:30	64	15	3	3	0	0	85	76	14	3	0	1	0	94
11:45	87	11	1	2	1	0	102	92	13	1	0	0	1	107
Hour	304	61	9	6	2	0	382	340	44	13	0	1	1	399
12:00	72	14	3	0	0	0	89	90	18	1	0	1	0	110
12:15	114	13	8	1	1	0	137	83	15	5	0	0	0	103
12:30	99	9	4	1	0	0	113	78	13	4	1	1	0	97
12:45	98	9	3	0	0	0	110	67	9	2	1	0	0	79
Hour	383	45	18	2	1	0	449	318	55	12	2	2	0	389
13:00	87	6	3	0	1	1	98	95	13	3	1	1	0	113
13:15	108	7	7	0	0	0	122	58	5	4	0	0	1	68
13:30	78	4	1	2	1	1	87	82	7	4	0	1	0	94
13:45	78	10	1	0	0	0	89	112	15	8	1	0	0	136
Hour	351	27	12	2	2	2	396	347	40	19	2	2	1	411
14:00	110	12	1	1	1	0	125	66	8	4	0	0	3	81
14:15	83	7	0	1	2	0	93	97	16	1	0	0	0	114
14:30	90	18	3	1	0	0	112	72	6	3	1	1	0	83
14:45	100	8	2	0	1	0	111	96	10	2	1	0	2	111
Hour	383	45	6	3	4	0	441	331	40	10	2	1	5	389
15:00	80	7	3	0	1	1	92	85	14	3	2	1	1	106
15:15	99	5	1	0	0	0	105	91	17	2	0	0	0	110
15:30	88	8	1	0	1	0	98	103	19	2	1	1	0	126
15:45	94	8	0	1	0	1	104	106	14	2	0	0	0	122
Hour	361	28	5	1	2	2	399	385	64	9	3	2	1	464
16:00	117	10	2	0	0	0	129	103	13	1	1	1	0	119
16:15	85	6	0	0	0	0	91	85	19	0	1	0	0	105
16:30	101	6	0	0	1	1	109	94	11	2	0	1	1	109
16:45	100	5	1	0	0	0	106	111	12	0	0	0	0	123
Hour	403	27	3	0	1	1	435	393	55	3	2	2	1	456
17:00	121	5	0	0	0	1	127	103	12	2	1	0	1	119
17:15	100	5	1	0	1	0	107	79	12	1	0	1	0	93
17:30	119	4	1	0	1	1	126	90	11	0	0	1	0	102
17:45	117	6	0	0	1	0	124	89	8	0	0	0	0	97
Hour	457	20	2	0	3	2	484	361	43	3	1	2	1	411
18:00	109	4	1	0	1	2	117	116	14	0	1	2	2	135
18:15	114	5	0	0	0	0	119	76	5	2	0	0	0	83
18:30	105	0	0	0	1	0	106	55	6	0	0	1	0	62
18:45	85	5	0	0	0	0	90	68	6	1	0	0	0	75
Hour	413	14	1	0	2	2	432	315	31	3	1	3	2	355
Total	4088	506	102	25	25	13	4759	4055	502	109	22	21	19	4728

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	A to C - Howth Rd(W) to Howth Rd(E)						Veh. Total	A to B - Howth Rd(W) to Offington Pk						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	34	13	2	1	0	0	50	1	1	0	0	0	0	2
07:15	45	15	3	0	1	1	65	0	0	0	0	0	0	0
07:30	31	18	1	0	0	0	50	2	2	0	0	0	0	4
07:45	42	15	3	0	0	0	60	0	0	0	0	0	0	0
Hour	152	61	9	1	1	1	225	3	3	0	0	0	0	6
08:00	30	12	1	0	1	0	44	1	1	0	0	0	0	2
08:15	33	9	2	1	0	1	46	9	1	0	0	0	0	10
08:30	58	13	0	1	0	0	72	20	1	0	0	0	0	21
08:45	107	18	2	0	1	0	128	28	1	0	0	0	0	29
Hour	228	52	5	2	2	1	290	58	4	0	0	0	0	62
09:00	53	15	2	0	0	0	70	8	1	0	0	0	0	9
09:15	53	14	3	2	1	0	73	5	1	0	2	0	0	8
09:30	67	20	2	1	0	0	90	5	1	0	0	0	0	6
09:45	82	14	3	1	0	0	100	5	2	1	0	0	0	8
Hour	255	63	10	4	1	0	333	23	5	1	2	0	0	31
10:00	72	8	3	0	2	0	85	3	0	0	0	0	0	3
10:15	60	10	1	1	0	0	72	9	0	0	1	0	0	10
10:30	67	17	10	0	0	2	96	3	0	0	0	0	0	3
10:45	72	10	2	0	2	0	86	3	0	0	0	0	0	3
Hour	271	45	16	1	4	2	339	18	0	0	1	0	0	19
11:00	72	14	2	0	0	0	88	8	2	0	0	0	0	10
11:15	64	17	5	0	1	0	87	9	3	0	0	0	0	12
11:30	63	14	3	2	0	0	82	5	0	0	0	0	0	5
11:45	85	10	1	1	1	0	98	3	0	0	1	0	0	4
Hour	284	55	11	3	2	0	355	25	5	0	1	0	0	31
12:00	67	11	2	0	0	0	80	5	2	0	0	0	0	7
12:15	98	13	7	1	1	0	120	7	0	0	0	0	0	7
12:30	89	7	2	1	0	0	99	15	2	0	0	0	0	17
12:45	88	11	3	0	0	0	102	12	0	0	0	0	0	12
Hour	342	42	14	2	1	0	401	39	4	0	0	0	0	43
13:00	81	5	3	0	1	1	91	11	2	0	0	0	0	13
13:15	94	7	7	0	0	0	108	3	1	0	0	0	0	4
13:30	64	6	2	2	1	1	76	4	0	0	0	0	0	4
13:45	81	12	1	0	0	0	94	14	0	0	0	0	0	14
Hour	320	30	13	2	2	2	369	32	3	0	0	0	0	35
14:00	88	11	1	1	1	0	102	22	1	0	0	0	0	23
14:15	79	6	0	1	1	0	87	13	0	0	0	0	0	13
14:30	81	18	3	1	1	0	104	7	1	0	0	0	0	8
14:45	86	6	2	0	1	0	95	3	0	0	0	0	0	3
Hour	334	41	6	3	4	0	388	45	2	0	0	0	0	47
15:00	69	8	3	0	1	1	82	6	0	0	0	0	0	6
15:15	81	2	0	0	0	0	83	13	1	0	0	0	0	14
15:30	74	9	2	0	1	0	86	8	1	0	0	0	0	9
15:45	91	7	0	0	0	1	99	17	1	0	0	0	0	18
Hour	315	26	5	0	2	2	350	44	3	0	0	0	0	47
16:00	92	11	2	1	0	0	106	17	0	0	0	0	0	17
16:15	80	6	0	0	0	0	86	12	0	0	0	0	0	12
16:30	89	6	0	0	1	1	97	10	0	0	0	0	0	10
16:45	84	4	0	0	0	0	88	10	1	1	0	0	0	12
Hour	345	27	2	1	1	1	377	49	1	1	0	0	0	51
17:00	102	5	0	0	0	0	107	23	0	0	0	0	0	23
17:15	90	7	0	0	1	1	99	9	0	0	0	0	0	9
17:30	99	5	2	0	1	1	108	12	0	0	0	0	0	12
17:45	103	5	0	0	1	0	109	13	0	0	0	0	0	13
Hour	394	22	2	0	3	2	423	57	0	0	0	0	0	57
18:00	94	4	0	0	1	1	100	15	0	0	0	0	0	15
18:15	95	5	1	0	0	0	101	21	0	0	0	0	0	21
18:30	98	1	0	0	1	0	100	11	0	0	0	0	0	11
18:45	71	5	0	0	0	0	76	9	0	0	0	0	0	9
Hour	358	15	1	0	2	1	377	56	0	0	0	0	0	56
Total	3598	479	94	19	25	12	4227	449	30	2	4	0	0	485

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	B to A - Offington Pk to Howth Rd(W)						Veh. Total	B to C - Offington Pk to Howth Rd(E)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	4	0	0	0	0	0	4	3	0	0	0	0	0	3
07:15	10	0	1	0	0	0	11	4	0	0	0	0	0	4
07:30	6	0	0	0	0	0	6	7	1	0	0	0	0	8
07:45	10	0	0	0	0	1	11	18	0	0	0	0	0	18
Hour	30	0	1	0	0	1	32	32	1	0	0	0	0	33
08:00	13	1	0	0	0	0	14	10	0	1	0	0	0	11
08:15	17	0	0	0	0	0	17	16	0	0	0	0	0	16
08:30	38	0	0	0	0	0	38	39	0	0	0	0	0	39
08:45	26	2	0	0	0	0	28	41	1	0	0	0	0	42
Hour	94	3	0	0	0	0	97	106	1	1	0	0	0	108
09:00	17	1	0	0	0	0	18	12	0	0	0	0	0	12
09:15	9	0	0	1	0	0	10	13	1	1	0	0	0	15
09:30	10	0	0	0	0	0	10	8	1	0	0	0	0	9
09:45	10	0	0	0	0	0	10	8	1	0	0	0	0	9
Hour	46	1	0	1	0	0	48	41	3	1	0	0	0	45
10:00	7	0	0	0	0	0	7	15	2	0	0	0	0	17
10:15	11	0	0	0	0	0	11	8	0	0	0	0	0	8
10:30	10	1	1	1	0	0	13	5	0	0	0	0	0	5
10:45	4	0	0	0	0	0	4	10	0	0	0	0	0	10
Hour	32	1	1	1	0	0	35	38	2	0	0	0	0	40
11:00	6	0	0	0	0	0	6	4	2	1	0	0	0	7
11:15	11	0	0	0	0	0	11	6	0	0	0	0	0	6
11:30	7	2	0	0	0	0	9	12	1	0	0	0	0	13
11:45	9	1	0	0	0	0	10	10	0	0	0	0	0	10
Hour	33	3	0	0	0	0	36	32	3	1	0	0	0	36
12:00	6	0	0	0	0	0	6	6	2	0	0	0	0	8
12:15	7	0	0	0	0	0	7	15	2	0	0	0	0	17
12:30	4	0	0	0	0	0	4	10	0	1	0	0	0	11
12:45	9	1	0	0	0	0	10	12	0	0	0	0	0	12
Hour	26	1	0	0	0	0	27	43	4	1	0	0	0	48
13:00	8	1	0	0	0	0	9	12	2	0	0	0	0	14
13:15	10	1	0	0	0	0	11	10	1	0	0	0	0	11
13:30	10	1	0	0	0	0	11	8	0	0	0	0	0	8
13:45	6	0	0	0	0	0	6	13	1	1	0	0	0	15
Hour	34	3	0	0	0	0	37	43	4	1	0	0	0	48
14:00	7	0	0	0	0	0	7	6	1	0	0	0	0	7
14:15	17	1	0	0	0	0	18	15	0	0	0	0	1	16
14:30	5	1	0	0	1	0	7	8	0	0	0	0	0	8
14:45	10	1	0	0	0	0	11	9	1	0	0	0	0	10
Hour	39	3	0	0	1	0	43	38	2	0	0	0	1	41
15:00	7	1	0	1	0	0	9	13	0	0	0	0	0	13
15:15	6	1	0	0	0	0	7	14	1	0	0	0	0	15
15:30	17	1	0	0	0	0	18	22	1	0	0	0	0	23
15:45	26	5	0	0	0	0	31	22	1	0	0	1	0	24
Hour	56	8	0	1	0	0	65	71	3	0	0	1	0	75
16:00	6	1	0	0	0	0	7	11	1	0	0	0	0	12
16:15	8	0	0	0	0	0	8	9	0	1	0	0	0	10
16:30	8	1	0	0	0	0	9	10	1	0	0	0	0	11
16:45	9	0	0	0	0	0	9	14	0	0	0	0	0	14
Hour	31	2	0	0	0	0	33	44	2	1	0	0	0	47
17:00	6	0	0	0	0	0	6	13	1	0	0	0	0	14
17:15	8	0	0	0	0	0	8	10	0	0	0	0	0	10
17:30	7	1	0	0	0	0	8	9	0	0	0	0	0	9
17:45	6	0	0	0	0	0	6	17	0	0	0	0	0	17
Hour	27	1	0	0	0	0	28	49	1	0	0	0	0	50
18:00	7	0	0	0	0	0	7	12	0	0	0	0	0	12
18:15	7	0	0	0	0	0	7	13	1	0	0	0	0	14
18:30	6	0	0	0	0	0	6	15	0	0	0	0	0	15
18:45	4	0	0	0	0	0	4	20	1	0	0	0	0	21
Hour	24	0	0	0	0	0	24	60	2	0	0	0	0	62
Total	472	26	2	3	1	1	505	597	28	6	0	1	1	633

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	C to B - Howth Rd(E) to Offington Pk						Veh. Total	C to A - Howth Rd(E) to Howth Rd(W)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	2	0	0	0	0	0	2	47	5	0	0	1	0	53
07:15	3	0	0	0	0	0	3	60	1	2	1	0	0	64
07:30	4	0	0	0	0	0	4	49	2	2	0	1	0	54
07:45	7	0	0	0	0	0	7	66	4	1	0	1	0	72
Hour	16	0	0	0	0	0	16	222	12	5	1	3	0	243
08:00	3	1	0	0	0	0	4	81	4	3	2	0	0	90
08:15	10	0	0	0	0	0	10	65	4	0	0	0	0	69
08:30	39	1	0	0	0	0	40	70	4	3	0	0	1	78
08:45	9	0	0	0	0	0	9	54	6	0	0	0	1	61
Hour	61	2	0	0	0	0	63	270	18	6	2	0	2	298
09:00	12	0	0	0	0	1	13	97	8	2	1	1	0	109
09:15	5	0	0	0	0	0	5	75	11	2	1	0	0	89
09:30	5	0	0	0	0	0	5	55	6	2	0	0	2	65
09:45	4	0	0	0	0	0	4	71	9	2	1	0	0	83
Hour	26	0	0	0	0	1	27	298	34	8	3	1	2	346
10:00	7	0	0	0	0	0	7	61	15	2	0	1	1	80
10:15	5	0	0	0	0	0	5	55	6	4	0	0	1	66
10:30	7	1	0	0	0	0	8	53	6	2	1	1	0	63
10:45	2	1	0	0	0	0	3	66	13	9	0	0	0	88
Hour	21	2	0	0	0	0	23	235	40	17	1	2	2	297
11:00	6	0	1	0	0	0	7	80	9	5	0	0	0	94
11:15	10	1	0	0	0	0	11	67	8	3	0	0	0	78
11:30	6	1	0	0	0	0	7	83	10	4	0	1	0	98
11:45	6	1	0	0	0	0	7	75	7	1	0	0	1	84
Hour	28	3	1	0	0	0	32	305	34	13	0	1	1	354
12:00	8	0	0	0	0	0	8	77	6	3	0	1	0	87
12:15	5	0	1	0	0	0	6	72	13	6	0	0	0	91
12:30	5	1	1	0	0	0	7	68	13	3	1	1	0	86
12:45	24	0	0	0	0	0	24	73	7	3	1	0	0	84
Hour	42	1	2	0	0	0	45	290	39	15	2	2	0	348
13:00	19	2	2	0	0	0	23	69	7	4	1	1	0	82
13:15	9	2	0	0	0	0	11	66	4	1	0	1	1	73
13:30	12	0	0	1	0	0	13	87	8	6	0	0	0	101
13:45	16	0	0	0	0	0	16	79	8	4	0	0	0	91
Hour	56	4	2	1	0	0	63	301	27	15	1	2	1	347
14:00	14	2	0	0	0	0	16	57	9	3	0	0	3	72
14:15	12	0	0	0	0	0	12	74	12	1	0	0	0	87
14:30	11	1	0	1	0	0	13	73	5	3	1	0	0	82
14:45	10	0	1	0	0	0	11	76	9	0	2	0	3	90
Hour	47	3	1	1	0	0	52	280	35	7	3	0	6	331
15:00	7	0	0	0	0	0	7	77	8	4	0	1	1	91
15:15	17	1	0	0	0	0	18	84	15	2	0	0	0	101
15:30	19	1	0	0	0	0	20	103	18	4	1	1	0	127
15:45	11	1	0	0	0	0	12	88	7	0	0	0	0	95
Hour	54	3	0	0	0	0	57	352	48	10	1	2	1	414
16:00	8	0	1	0	0	0	9	82	9	1	1	1	0	94
16:15	11	0	0	0	0	0	11	75	13	0	1	0	0	89
16:30	10	0	0	0	0	0	10	95	6	2	0	1	1	105
16:45	12	2	0	0	0	0	14	95	11	0	0	0	0	106
Hour	41	2	1	0	0	0	44	347	39	3	2	2	1	394
17:00	10	0	0	0	0	0	10	88	10	2	1	0	1	102
17:15	6	0	0	0	0	0	6	75	10	1	0	1	0	87
17:30	10	1	0	0	0	0	11	84	7	0	0	1	0	92
17:45	19	1	0	0	0	0	20	85	6	0	0	0	0	91
Hour	45	2	0	0	0	0	47	332	33	3	1	2	1	372
18:00	14	0	0	0	0	0	14	108	12	0	1	2	2	125
18:15	8	0	0	0	0	0	8	69	5	2	0	0	0	76
18:30	8	0	0	0	0	0	8	52	5	0	0	1	0	58
18:45	7	1	0	0	0	0	8	52	5	1	0	0	0	58
Hour	37	1	0	0	0	0	38	281	27	3	1	3	2	317
Total	474	23	7	2	0	1	507	3513	386	105	18	20	19	4061

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm A - Howth Rd(W)						Veh. Total	From Arm A - Howth Rd(W)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	51	5	0	0	1	0	57	35	14	2	1	0	0	52
07:15	70	1	3	1	0	0	75	45	15	3	0	1	1	65
07:30	55	2	2	0	1	0	60	33	20	1	0	0	0	54
07:45	76	4	1	0	1	1	83	42	15	3	0	0	0	60
Hour	252	12	6	1	3	1	275	155	64	9	1	1	1	231
08:00	94	5	3	2	0	0	104	31	13	1	0	1	0	46
08:15	82	4	0	0	0	0	86	42	10	2	1	0	1	56
08:30	108	4	3	0	0	1	116	78	14	0	1	0	0	93
08:45	80	8	0	0	0	1	89	135	19	2	0	1	0	157
Hour	364	21	6	2	0	2	395	286	56	5	2	2	1	352
09:00	114	9	2	1	1	0	127	61	16	2	0	0	0	79
09:15	84	11	2	2	0	0	99	58	15	3	4	1	0	81
09:30	65	6	2	0	0	2	75	72	21	2	1	0	0	96
09:45	81	9	2	1	0	0	93	87	16	4	1	0	0	108
Hour	344	35	8	4	1	2	394	278	68	11	6	1	0	364
10:00	68	15	2	0	1	1	87	75	8	3	0	2	0	88
10:15	66	6	4	0	0	1	77	69	10	1	2	0	0	82
10:30	63	7	3	2	1	0	76	70	17	10	0	0	2	99
10:45	70	13	9	0	0	0	92	75	10	2	0	2	0	89
Hour	267	41	18	2	2	2	332	289	45	16	2	4	2	358
11:00	86	9	5	0	0	0	100	80	16	2	0	0	0	98
11:15	78	8	3	0	0	0	89	73	20	5	0	1	0	99
11:30	90	12	4	0	1	0	107	68	14	3	2	0	0	87
11:45	84	8	1	0	0	1	94	88	10	1	2	1	0	102
Hour	338	37	13	0	1	1	390	309	60	11	4	2	0	386
12:00	83	6	3	0	1	0	93	72	13	2	0	0	0	87
12:15	79	13	6	0	0	0	98	105	13	7	1	1	0	127
12:30	72	13	3	1	1	0	90	104	9	2	1	0	0	116
12:45	82	8	3	1	0	0	94	100	11	3	0	0	0	114
Hour	316	40	15	2	2	0	375	381	46	14	2	1	0	444
13:00	77	8	4	1	1	0	91	92	7	3	0	1	1	104
13:15	76	5	1	0	1	1	84	97	8	7	0	0	0	112
13:30	97	9	6	0	0	0	112	68	6	2	2	1	1	80
13:45	85	8	4	0	0	0	97	95	12	1	0	0	0	108
Hour	335	30	15	1	2	1	384	352	33	13	2	2	2	404
14:00	64	9	3	0	0	3	79	110	12	1	1	1	0	125
14:15	91	13	1	0	0	0	105	92	6	0	1	1	0	100
14:30	78	6	3	1	1	0	89	88	19	3	1	1	0	112
14:45	86	10	0	2	0	3	101	89	6	2	0	1	0	98
Hour	319	38	7	3	1	6	374	379	43	6	3	4	0	435
15:00	84	9	4	1	1	1	100	75	8	3	0	1	1	88
15:15	90	16	2	0	0	0	108	94	3	0	0	0	0	97
15:30	120	19	4	1	1	0	145	82	10	2	0	1	0	95
15:45	114	12	0	0	0	0	126	108	8	0	0	0	1	117
Hour	408	56	10	2	2	1	479	359	29	5	0	2	2	397
16:00	88	10	1	1	1	0	101	109	11	2	1	0	0	123
16:15	83	13	0	1	0	0	97	92	6	0	0	0	0	98
16:30	103	7	2	0	1	1	114	99	6	0	0	1	1	107
16:45	104	11	0	0	0	0	115	94	5	1	0	0	0	100
Hour	378	41	3	2	2	1	427	394	28	3	1	1	1	428
17:00	94	10	2	1	0	1	108	125	5	0	0	0	0	130
17:15	83	10	1	0	1	0	95	99	7	0	0	1	1	108
17:30	91	8	0	0	1	0	100	111	5	2	0	1	1	120
17:45	91	6	0	0	0	0	97	116	5	0	0	1	0	122
Hour	359	34	3	1	2	1	400	451	22	2	0	3	2	480
18:00	115	12	0	1	2	2	132	109	4	0	0	1	1	115
18:15	76	5	2	0	0	0	83	116	5	1	0	0	0	122
18:30	58	5	0	0	1	0	64	109	1	0	0	1	0	111
18:45	56	5	1	0	0	0	62	80	5	0	0	0	0	85
Hour	305	27	3	1	3	2	341	414	15	1	0	2	1	433
Total	3965	412	107	21	21	20	4566	4047	509	96	23	25	12	4712

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm B - Offington Pk						Veh. Total	From Arm B - Offington Pk						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	3	1	0	0	0	0	4	7	0	0	0	0	0	7
07:15	3	0	0	0	0	0	3	14	0	1	0	0	0	15
07:30	6	2	0	0	0	0	8	13	1	0	0	0	0	14
07:45	7	0	0	0	0	0	7	28	0	0	0	0	1	29
Hour	19	3	0	0	0	0	22	62	1	1	0	0	1	65
08:00	4	2	0	0	0	0	6	23	1	1	0	0	0	25
08:15	19	1	0	0	0	0	20	33	0	0	0	0	0	33
08:30	59	2	0	0	0	0	61	77	0	0	0	0	0	77
08:45	37	1	0	0	0	0	38	67	3	0	0	0	0	70
Hour	119	6	0	0	0	0	125	200	4	1	0	0	0	205
09:00	20	1	0	0	0	1	22	29	1	0	0	0	0	30
09:15	10	1	0	2	0	0	13	22	1	1	1	0	0	25
09:30	10	1	0	0	0	0	11	18	1	0	0	0	0	19
09:45	9	2	1	0	0	0	12	18	1	0	0	0	0	19
Hour	49	5	1	2	0	1	58	87	4	1	1	0	0	93
10:00	10	0	0	0	0	0	10	22	2	0	0	0	0	24
10:15	14	0	0	1	0	0	15	19	0	0	0	0	0	19
10:30	10	1	0	0	0	0	11	15	1	1	1	0	0	18
10:45	5	1	0	0	0	0	6	14	0	0	0	0	0	14
Hour	39	2	0	1	0	0	42	70	3	1	1	0	0	75
11:00	14	2	1	0	0	0	17	10	2	1	0	0	0	13
11:15	19	4	0	0	0	0	23	17	0	0	0	0	0	17
11:30	11	1	0	0	0	0	12	19	3	0	0	0	0	22
11:45	9	1	0	1	0	0	11	19	1	0	0	0	0	20
Hour	53	8	1	1	0	0	63	65	6	1	0	0	0	72
12:00	13	2	0	0	0	0	15	12	2	0	0	0	0	14
12:15	12	0	1	0	0	0	13	22	2	0	0	0	0	24
12:30	20	3	1	0	0	0	24	14	0	1	0	0	0	15
12:45	36	0	0	0	0	0	36	21	1	0	0	0	0	22
Hour	81	5	2	0	0	0	88	69	5	1	0	0	0	75
13:00	30	4	2	0	0	0	36	20	3	0	0	0	0	23
13:15	12	3	0	0	0	0	15	20	2	0	0	0	0	22
13:30	16	0	0	1	0	0	17	18	1	0	0	0	0	19
13:45	30	0	0	0	0	0	30	19	1	1	0	0	0	21
Hour	88	7	2	1	0	0	98	77	7	1	0	0	0	85
14:00	36	3	0	0	0	0	39	13	1	0	0	0	0	14
14:15	25	0	0	0	0	0	25	32	1	0	0	0	1	34
14:30	18	2	0	1	0	0	21	13	1	0	0	1	0	15
14:45	13	0	1	0	0	0	14	19	2	0	0	0	0	21
Hour	92	5	1	1	0	0	99	77	5	0	0	1	1	84
15:00	13	0	0	0	0	0	13	20	1	0	1	0	0	22
15:15	30	2	0	0	0	0	32	20	2	0	0	0	0	22
15:30	27	2	0	0	0	0	29	39	2	0	0	0	0	41
15:45	28	2	0	0	0	0	30	48	6	0	0	1	0	55
Hour	98	6	0	0	0	0	104	127	11	0	1	1	0	140
16:00	25	0	1	0	0	0	26	17	2	0	0	0	0	19
16:15	23	0	0	0	0	0	23	17	0	1	0	0	0	18
16:30	20	0	0	0	0	0	20	18	2	0	0	0	0	20
16:45	22	3	1	0	0	0	26	23	0	0	0	0	0	23
Hour	90	3	2	0	0	0	95	75	4	1	0	0	0	80
17:00	33	0	0	0	0	0	33	19	1	0	0	0	0	20
17:15	15	0	0	0	0	0	15	18	0	0	0	0	0	18
17:30	22	1	0	0	0	0	23	16	1	0	0	0	0	17
17:45	32	1	0	0	0	0	33	23	0	0	0	0	0	23
Hour	102	2	0	0	0	0	104	76	2	0	0	0	0	78
18:00	29	0	0	0	0	0	29	19	0	0	0	0	0	19
18:15	29	0	0	0	0	0	29	20	1	0	0	0	0	21
18:30	19	0	0	0	0	0	19	21	0	0	0	0	0	21
18:45	16	1	0	0	0	0	17	24	1	0	0	0	0	25
Hour	93	1	0	0	0	0	94	84	2	0	0	0	0	86
Total	923	53	9	6	0	1	992	1069	54	8	3	2	2	1138

Site No. 3
Location Howth Rd(W) / Offington Pk / Howth Rd(E)
Date Tuesday 26 September 2023

Time	To Arm C - Howth Rd(E)						Veh. Total	From Arm C - Howth Rd(E)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	37	13	2	1	0	0	53	49	5	0	0	1	0	55
07:15	49	15	3	0	1	1	69	63	1	2	1	0	0	67
07:30	38	19	1	0	0	0	58	53	2	2	0	1	0	58
07:45	60	15	3	0	0	0	78	73	4	1	0	1	0	79
Hour	184	62	9	1	1	1	258	238	12	5	1	3	0	259
08:00	40	12	2	0	1	0	55	84	5	3	2	0	0	94
08:15	49	9	2	1	0	1	62	75	4	0	0	0	0	79
08:30	97	13	0	1	0	0	111	109	5	3	0	0	1	118
08:45	148	19	2	0	1	0	170	63	6	0	0	0	1	70
Hour	334	53	6	2	2	1	398	331	20	6	2	0	2	361
09:00	65	15	2	0	0	0	82	109	8	2	1	1	1	122
09:15	66	15	4	2	1	0	88	80	11	2	1	0	0	94
09:30	75	21	2	1	0	0	99	60	6	2	0	0	2	70
09:45	90	15	3	1	0	0	109	75	9	2	1	0	0	87
Hour	296	66	11	4	1	0	378	324	34	8	3	1	3	373
10:00	87	10	3	0	2	0	102	68	15	2	0	1	1	87
10:15	68	10	1	1	0	0	80	60	6	4	0	0	1	71
10:30	72	17	10	0	0	2	101	60	7	2	1	1	0	71
10:45	82	10	2	0	2	0	96	68	14	9	0	0	0	91
Hour	309	47	16	1	4	2	379	256	42	17	1	2	2	320
11:00	76	16	3	0	0	0	95	86	9	6	0	0	0	101
11:15	70	17	5	0	1	0	93	77	9	3	0	0	0	89
11:30	75	15	3	2	0	0	95	89	11	4	0	1	0	105
11:45	95	10	1	1	1	0	108	81	8	1	0	0	1	91
Hour	316	58	12	3	2	0	391	333	37	14	0	1	1	386
12:00	73	13	2	0	0	0	88	85	6	3	0	1	0	95
12:15	113	15	7	1	1	0	137	77	13	7	0	0	0	97
12:30	99	7	3	1	0	0	110	73	14	4	1	1	0	93
12:45	100	11	3	0	0	0	114	97	7	3	1	0	0	108
Hour	385	46	15	2	1	0	449	332	40	17	2	2	0	393
13:00	93	7	3	0	1	1	105	88	9	6	1	1	0	105
13:15	104	8	7	0	0	0	119	75	6	1	0	1	1	84
13:30	72	6	2	2	1	1	84	99	8	6	1	0	0	114
13:45	94	13	2	0	0	0	109	95	8	4	0	0	0	107
Hour	363	34	14	2	2	2	417	357	31	17	2	2	1	410
14:00	94	12	1	1	1	0	109	71	11	3	0	0	3	88
14:15	94	6	0	1	1	1	103	86	12	1	0	0	0	99
14:30	89	18	3	1	1	0	112	84	6	3	2	0	0	95
14:45	95	7	2	0	1	0	105	86	9	1	2	0	3	101
Hour	372	43	6	3	4	1	429	327	38	8	4	0	6	383
15:00	82	8	3	0	1	1	95	84	8	4	0	1	1	98
15:15	95	3	0	0	0	0	98	101	16	2	0	0	0	119
15:30	96	10	2	0	1	0	109	122	19	4	1	1	0	147
15:45	113	8	0	0	1	1	123	99	8	0	0	0	0	107
Hour	386	29	5	0	3	2	425	406	51	10	1	2	1	471
16:00	103	12	2	1	0	0	118	90	9	2	1	1	0	103
16:15	89	6	1	0	0	0	96	86	13	0	1	0	0	100
16:30	99	7	0	0	1	1	108	105	6	2	0	1	1	115
16:45	98	4	0	0	0	0	102	107	13	0	0	0	0	120
Hour	389	29	3	1	1	1	424	388	41	4	2	2	1	438
17:00	115	6	0	0	0	0	121	98	10	2	1	0	1	112
17:15	100	7	0	0	1	1	109	81	10	1	0	1	0	93
17:30	108	5	2	0	1	1	117	94	8	0	0	1	0	103
17:45	120	5	0	0	1	0	126	104	7	0	0	0	0	111
Hour	443	23	2	0	3	2	473	377	35	3	1	2	1	419
18:00	106	4	0	0	1	1	112	122	12	0	1	2	2	139
18:15	108	6	1	0	0	0	115	77	5	2	0	0	0	84
18:30	113	1	0	0	1	0	115	60	5	0	0	1	0	66
18:45	91	6	0	0	0	0	97	59	6	1	0	0	0	66
Hour	418	17	1	0	2	1	439	318	28	3	1	3	2	355
Total	4195	507	100	19	26	13	4860	3987	409	112	20	20	20	4568

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	A to C - Harbour Rd(W) to Harbour Rd(E)						Veh. Total	A to B - Harbour Rd(W) to Church St						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	13	5	0	0	1	0	19	8	1	0	0	0	0	9
07:15	28	6	0	0	1	0	35	6	2	0	0	0	0	8
07:30	26	4	0	0	1	0	31	11	4	0	0	0	0	15
07:45	31	8	1	0	0	0	40	13	3	1	0	0	0	17
Hour	98	23	1	0	3	0	125	38	10	1	0	0	0	49
08:00	15	9	0	0	2	0	26	13	1	0	0	0	0	14
08:15	17	4	1	0	0	0	22	21	2	1	0	0	0	24
08:30	32	4	0	0	0	0	36	45	3	0	0	0	0	48
08:45	46	13	2	0	1	0	62	58	3	0	0	0	0	61
Hour	110	30	3	0	3	0	146	137	9	1	0	0	0	147
09:00	36	8	3	0	0	0	47	19	0	0	0	0	0	19
09:15	46	10	2	0	1	0	59	15	4	1	0	0	0	20
09:30	33	11	1	0	0	0	45	13	1	0	0	0	0	14
09:45	58	11	2	0	1	0	72	13	2	0	0	0	0	15
Hour	173	40	8	0	2	0	223	60	7	1	0	0	0	68
10:00	42	1	0	0	1	0	44	18	2	0	0	0	0	20
10:15	41	9	6	2	0	0	58	16	0	0	0	0	0	16
10:30	43	5	3	0	0	0	51	14	3	1	0	0	1	19
10:45	43	2	1	0	3	0	49	15	0	0	0	0	0	15
Hour	169	17	10	2	4	0	202	63	5	1	0	0	1	70
11:00	48	8	1	0	0	0	57	18	1	1	0	0	0	20
11:15	37	5	3	0	1	0	46	10	1	1	0	0	0	12
11:30	40	8	3	0	0	0	51	18	2	0	0	0	0	20
11:45	54	3	1	1	1	0	60	21	2	0	0	0	0	23
Hour	179	24	8	1	2	0	214	67	6	2	0	0	0	75
12:00	48	11	2	0	1	0	62	15	1	0	0	0	0	16
12:15	54	6	3	0	0	0	63	21	1	0	0	0	0	22
12:30	50	6	0	0	1	0	57	27	2	0	0	0	0	29
12:45	62	6	3	0	1	0	72	18	1	0	0	0	0	19
Hour	214	29	8	0	3	0	254	81	5	0	0	0	0	86
13:00	57	2	2	0	1	1	63	29	3	1	0	0	0	33
13:15	44	1	2	0	0	0	47	26	1	0	0	0	0	27
13:30	50	4	3	1	0	0	58	21	0	0	0	0	0	21
13:45	63	3	3	0	2	1	72	28	0	1	0	0	0	29
Hour	214	10	10	1	3	2	240	104	4	2	0	0	0	110
14:00	45	10	0	0	1	1	57	27	1	0	0	0	0	28
14:15	44	2	1	0	0	0	47	43	1	0	0	0	0	44
14:30	51	6	0	0	1	1	59	24	3	0	0	0	0	27
14:45	51	5	2	0	2	0	60	33	2	0	0	0	0	35
Hour	191	23	3	0	4	2	223	127	7	0	0	0	0	134
15:00	47	4	0	0	1	0	52	21	2	0	0	0	0	23
15:15	62	1	0	0	1	0	64	28	0	0	0	0	0	28
15:30	57	7	1	0	1	0	66	36	3	0	0	0	0	39
15:45	48	4	0	0	2	0	54	36	1	0	0	0	0	37
Hour	214	16	1	0	5	0	236	121	6	0	0	0	0	127
16:00	53	3	0	0	1	1	58	34	6	0	0	0	0	40
16:15	64	5	0	0	0	0	69	33	0	0	0	0	0	33
16:30	59	4	0	0	0	0	63	34	3	1	0	0	0	38
16:45	66	1	0	0	2	0	69	38	3	0	0	0	1	42
Hour	242	13	0	0	3	1	259	139	12	1	0	0	1	153
17:00	55	2	0	0	0	0	57	42	3	0	0	0	0	45
17:15	62	2	0	0	1	0	65	40	2	0	0	0	1	43
17:30	54	3	1	0	0	1	59	51	2	1	0	0	0	54
17:45	68	2	0	0	2	0	72	51	2	0	0	0	0	53
Hour	239	9	1	0	3	1	253	184	9	1	0	0	1	195
18:00	57	4	0	0	0	0	61	41	0	0	0	0	1	42
18:15	53	4	0	0	1	0	58	29	3	0	0	0	0	32
18:30	62	0	0	0	1	0	63	30	3	0	0	0	0	33
18:45	58	5	0	0	1	0	64	27	0	0	0	0	0	27
Hour	230	13	0	0	3	0	246	127	6	0	0	0	1	134
Total	2273	247	53	4	38	6	2621	1248	86	10	0	0	4	1348

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	B to A - Church St to Harbour Rd(W)						Veh. Total	B to C - Church St to Harbour Rd(E)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	25	1	0	0	0	0	26	0	0	0	0	0	0	0
07:15	16	1	0	0	0	0	17	0	0	0	0	0	0	0
07:30	25	1	0	0	0	0	26	0	0	0	0	0	0	0
07:45	35	3	1	0	0	0	39	1	0	0	0	0	0	1
Hour	101	6	1	0	0	0	108	1	0	0	0	0	0	1
08:00	31	2	0	0	0	0	33	1	0	0	0	0	0	1
08:15	37	2	0	0	0	0	39	1	0	0	0	0	0	1
08:30	39	2	0	0	0	0	41	0	0	0	0	0	0	0
08:45	51	0	0	0	0	0	51	1	0	0	0	0	0	1
Hour	158	6	0	0	0	0	164	3	0	0	0	0	0	3
09:00	34	3	0	0	0	0	37	0	0	0	0	0	0	0
09:15	26	1	0	0	0	0	27	1	0	0	0	0	0	1
09:30	18	1	0	0	0	1	20	0	0	0	0	0	0	0
09:45	20	5	0	0	0	0	25	1	0	0	0	0	0	1
Hour	98	10	0	0	0	1	109	2	0	0	0	0	0	2
10:00	14	2	0	0	0	1	17	0	0	0	0	0	0	0
10:15	19	1	0	0	0	0	20	1	0	0	0	0	0	1
10:30	12	1	1	0	0	0	14	0	1	0	0	0	0	1
10:45	27	4	1	0	0	0	32	0	0	0	0	0	0	0
Hour	72	8	2	0	0	1	83	1	1	0	0	0	0	2
11:00	12	0	0	0	0	0	12	0	0	0	0	0	0	0
11:15	19	2	0	0	0	0	21	1	0	0	0	0	0	1
11:30	28	2	0	0	0	0	30	0	0	0	0	0	0	0
11:45	15	0	1	0	0	0	16	0	0	0	0	0	0	0
Hour	74	4	1	0	0	0	79	1	0	0	0	0	0	1
12:00	20	0	0	0	0	0	20	1	0	0	0	0	0	1
12:15	18	2	0	0	0	0	20	1	0	0	0	0	0	1
12:30	9	1	1	0	0	0	11	0	0	0	0	0	0	0
12:45	9	2	0	0	0	0	11	0	0	0	0	0	0	0
Hour	56	5	1	0	0	0	62	2	0	0	0	0	0	2
13:00	20	2	1	0	0	0	23	0	0	0	0	0	0	0
13:15	13	2	1	0	0	0	16	0	0	0	0	0	0	0
13:30	22	2	1	0	0	0	25	0	0	0	0	0	0	0
13:45	25	0	0	0	0	1	26	0	0	0	0	0	0	0
Hour	80	6	3	0	0	1	90	0	0	0	0	0	0	0
14:00	17	3	0	0	0	0	20	0	0	0	0	0	0	0
14:15	17	4	0	0	0	0	21	0	0	0	0	0	0	0
14:30	26	2	0	0	0	0	28	0	0	0	0	0	0	0
14:45	18	0	0	0	0	0	18	0	0	0	0	0	0	0
Hour	78	9	0	0	0	0	87	0	0	0	0	0	0	0
15:00	16	1	0	0	0	0	17	0	0	0	0	0	0	0
15:15	19	2	0	0	0	0	21	1	0	0	0	0	0	1
15:30	26	1	0	0	0	0	27	0	0	0	0	0	0	0
15:45	22	2	0	0	0	0	24	0	0	0	0	0	0	0
Hour	83	6	0	0	0	0	89	1	0	0	0	0	0	1
16:00	13	2	0	0	0	0	15	0	0	0	0	0	0	0
16:15	19	3	0	0	0	0	22	0	0	0	0	0	0	0
16:30	21	3	0	0	0	0	24	0	0	0	0	0	0	0
16:45	28	5	0	0	0	0	33	0	0	0	0	0	0	0
Hour	81	13	0	0	0	0	94	0	0	0	0	0	0	0
17:00	20	1	1	0	0	0	22	0	0	0	0	0	0	0
17:15	17	4	0	0	0	0	21	1	0	0	0	0	0	1
17:30	19	0	0	0	0	0	19	0	0	0	0	0	0	0
17:45	26	1	0	0	0	0	27	1	0	0	0	0	0	1
Hour	82	6	1	0	0	0	89	2	0	0	0	0	0	2
18:00	13	1	0	0	0	0	14	0	0	0	0	0	0	0
18:15	20	0	0	0	0	0	20	0	0	0	0	0	0	0
18:30	20	1	0	0	0	0	21	1	0	0	0	0	0	1
18:45	20	2	0	0	0	0	22	0	0	0	0	0	0	0
Hour	73	4	0	0	0	0	77	1	0	0	0	0	0	1
Total	1036	83	9	0	0	3	1131	14	1	0	0	0	0	15

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	C to B - Harbour Rd(E) to Church St						Veh. Total	C to A - Harbour Rd(E) to Harbour Rd(W)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	0	0	0	0	0	0	0	30	4	0	0	0	0	34
07:15	0	0	0	0	0	0	0	44	3	2	0	0	0	49
07:30	1	0	0	0	0	0	1	49	3	0	0	2	0	54
07:45	0	0	0	0	0	0	0	51	1	0	0	1	0	53
Hour	1	0	0	0	0	0	1	174	11	2	0	3	0	190
08:00	0	0	0	0	0	0	0	45	6	1	0	0	0	52
08:15	0	0	0	0	0	0	0	51	1	1	0	0	0	53
08:30	0	0	0	0	0	0	0	53	5	0	0	0	0	58
08:45	1	1	0	0	0	0	2	51	5	0	0	1	0	57
Hour	1	1	0	0	0	0	2	200	17	2	0	1	0	220
09:00	2	0	0	0	0	0	2	64	8	2	0	0	0	74
09:15	0	0	0	0	0	0	0	44	4	2	0	0	0	50
09:30	0	0	0	0	0	0	0	42	11	3	0	1	1	58
09:45	0	0	0	0	0	0	0	41	5	2	0	1	0	49
Hour	2	0	0	0	0	0	2	191	28	9	0	2	1	231
10:00	0	0	0	0	0	0	0	53	8	0	0	0	0	61
10:15	1	0	0	0	0	0	1	32	5	3	0	0	1	41
10:30	1	0	0	0	0	0	1	44	5	2	0	1	0	52
10:45	1	0	0	0	0	0	1	36	9	5	0	0	0	50
Hour	3	0	0	0	0	0	3	165	27	10	0	1	1	204
11:00	1	0	0	0	0	0	1	58	4	1	0	1	0	64
11:15	0	0	0	0	0	0	0	38	4	2	0	0	0	44
11:30	0	0	0	0	0	0	0	48	7	6	0	1	0	62
11:45	1	0	0	0	0	0	1	48	3	2	0	1	1	55
Hour	2	0	0	0	0	0	2	192	18	11	0	3	1	225
12:00	1	0	0	0	0	0	1	53	7	1	0	1	0	62
12:15	0	0	0	0	0	0	0	40	3	5	0	1	0	49
12:30	1	0	0	0	0	0	1	54	7	0	2	0	0	63
12:45	2	0	0	0	0	0	2	58	7	0	0	1	0	66
Hour	4	0	0	0	0	0	4	205	24	6	2	3	0	240
13:00	2	0	0	0	0	0	2	58	9	1	0	0	0	68
13:15	1	0	0	0	0	0	1	42	3	0	0	2	1	48
13:30	0	0	0	0	0	0	0	41	6	3	0	0	0	50
13:45	3	0	0	0	0	0	3	60	4	1	0	0	0	65
Hour	6	0	0	0	0	0	6	201	22	5	0	2	1	231
14:00	1	0	0	0	0	0	1	39	6	3	0	1	1	50
14:15	2	0	0	0	0	0	2	44	6	0	0	1	0	51
14:30	1	0	0	0	0	0	1	48	8	0	0	0	0	56
14:45	2	0	0	0	0	0	2	51	7	0	1	0	1	60
Hour	6	0	0	0	0	0	6	182	27	3	1	2	2	217
15:00	2	0	0	0	0	0	2	38	6	0	0	1	0	45
15:15	2	0	0	0	0	0	2	69	10	3	0	3	0	85
15:30	2	0	0	0	0	0	2	72	11	2	1	0	1	87
15:45	0	0	0	0	0	0	0	53	7	0	0	1	0	61
Hour	6	0	0	0	0	0	6	232	34	5	1	5	1	278
16:00	1	0	0	0	0	0	1	54	8	1	0	0	0	63
16:15	4	0	0	0	0	0	4	48	11	1	0	2	0	62
16:30	3	0	0	0	0	0	3	45	2	1	0	0	1	49
16:45	0	0	0	0	0	0	0	58	5	0	0	0	0	63
Hour	8	0	0	0	0	0	8	205	26	3	0	2	1	237
17:00	2	0	0	0	0	0	2	66	5	0	0	2	0	73
17:15	4	0	0	0	0	0	4	45	2	0	0	2	0	49
17:30	2	0	0	0	0	0	2	35	6	0	0	0	0	41
17:45	3	0	0	0	0	0	3	59	5	0	0	0	1	65
Hour	11	0	0	0	0	0	11	205	18	0	0	4	1	228
18:00	1	0	0	0	0	0	1	44	4	0	0	0	0	48
18:15	0	0	0	0	0	0	0	37	3	0	0	2	0	42
18:30	0	0	0	0	0	0	0	37	2	0	0	0	0	39
18:45	0	0	0	0	0	0	0	43	3	1	0	1	0	48
Hour	1	0	0	0	0	0	1	161	12	1	0	3	0	177
Total	51	1	0	0	0	0	52	2313	264	57	4	31	9	2678

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	To Arm A - Harbour Rd(W)						Veh. Total	From Arm A - Harbour Rd(W)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	55	5	0	0	0	0	60	21	6	0	0	1	0	28
07:15	60	4	2	0	0	0	66	34	8	0	0	1	0	43
07:30	74	4	0	0	2	0	80	37	8	0	0	1	0	46
07:45	86	4	1	0	1	0	92	44	11	2	0	0	0	57
Hour	275	17	3	0	3	0	298	136	33	2	0	3	0	174
08:00	76	8	1	0	0	0	85	28	10	0	0	2	0	40
08:15	88	3	1	0	0	0	92	38	6	2	0	0	0	46
08:30	92	7	0	0	0	0	99	77	7	0	0	0	0	84
08:45	102	5	0	0	1	0	108	104	16	2	0	1	0	123
Hour	358	23	2	0	1	0	384	247	39	4	0	3	0	293
09:00	98	11	2	0	0	0	111	55	8	3	0	0	0	66
09:15	70	5	2	0	0	0	77	61	14	3	0	1	0	79
09:30	60	12	3	0	1	2	78	46	12	1	0	0	0	59
09:45	61	10	2	0	1	0	74	71	13	2	0	1	0	87
Hour	289	38	9	0	2	2	340	233	47	9	0	2	0	291
10:00	67	10	0	0	0	1	78	60	3	0	0	1	0	64
10:15	51	6	3	0	0	1	61	57	9	6	2	0	0	74
10:30	56	6	3	0	1	0	66	57	8	4	0	0	1	70
10:45	63	13	6	0	0	0	82	58	2	1	0	3	0	64
Hour	237	35	12	0	1	2	287	232	22	11	2	4	1	272
11:00	70	4	1	0	1	0	76	66	9	2	0	0	0	77
11:15	57	6	2	0	0	0	65	47	6	4	0	1	0	58
11:30	76	9	6	0	1	0	92	58	10	3	0	0	0	71
11:45	63	3	3	0	1	1	71	75	5	1	1	1	0	83
Hour	266	22	12	0	3	1	304	246	30	10	1	2	0	289
12:00	73	7	1	0	1	0	82	63	12	2	0	1	0	78
12:15	58	5	5	0	1	0	69	75	7	3	0	0	0	85
12:30	63	8	1	2	0	0	74	77	8	0	0	1	0	86
12:45	67	9	0	0	1	0	77	80	7	3	0	1	0	91
Hour	261	29	7	2	3	0	302	295	34	8	0	3	0	340
13:00	78	11	2	0	0	0	91	86	5	3	0	1	1	96
13:15	55	5	1	0	2	1	64	70	2	2	0	0	0	74
13:30	63	8	4	0	0	0	75	71	4	3	1	0	0	79
13:45	85	4	1	0	0	1	91	91	3	4	0	2	1	101
Hour	281	28	8	0	2	2	321	318	14	12	1	3	2	350
14:00	56	9	3	0	1	1	70	72	11	0	0	1	1	85
14:15	61	10	0	0	1	0	72	87	3	1	0	0	0	91
14:30	74	10	0	0	0	0	84	75	9	0	0	1	1	86
14:45	69	7	0	1	0	1	78	84	7	2	0	2	0	95
Hour	260	36	3	1	2	2	304	318	30	3	0	4	2	357
15:00	54	7	0	0	1	0	62	68	6	0	0	1	0	75
15:15	88	12	3	0	3	0	106	90	1	0	0	1	0	92
15:30	98	12	2	1	0	1	114	93	10	1	0	1	0	105
15:45	75	9	0	0	1	0	85	84	5	0	0	2	0	91
Hour	315	40	5	1	5	1	367	335	22	1	0	5	0	363
16:00	67	10	1	0	0	0	78	87	9	0	0	1	1	98
16:15	67	14	1	0	2	0	84	97	5	0	0	0	0	102
16:30	66	5	1	0	0	1	73	93	7	1	0	0	0	101
16:45	86	10	0	0	0	0	96	104	4	0	0	2	1	111
Hour	286	39	3	0	2	1	331	381	25	1	0	3	2	412
17:00	86	6	1	0	2	0	95	97	5	0	0	0	0	102
17:15	62	6	0	0	2	0	70	102	4	0	0	1	1	108
17:30	54	6	0	0	0	0	60	105	5	2	0	0	1	113
17:45	85	6	0	0	0	1	92	119	4	0	0	2	0	125
Hour	287	24	1	0	4	1	317	423	18	2	0	3	2	448
18:00	57	5	0	0	0	0	62	98	4	0	0	0	1	103
18:15	57	3	0	0	2	0	62	82	7	0	0	1	0	90
18:30	57	3	0	0	0	0	60	92	3	0	0	1	0	96
18:45	63	5	1	0	1	0	70	85	5	0	0	1	0	91
Hour	234	16	1	0	3	0	254	357	19	0	0	3	1	380
Total	3349	347	66	4	31	12	3809	3521	333	63	4	38	10	3969

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	To Arm B - Church St						Veh. Total	From Arm B - Church St						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	8	1	0	0	0	0	9	25	1	0	0	0	0	26
07:15	6	2	0	0	0	0	8	16	1	0	0	0	0	17
07:30	12	4	0	0	0	0	16	25	1	0	0	0	0	26
07:45	13	3	1	0	0	0	17	36	3	1	0	0	0	40
Hour	39	10	1	0	0	0	50	102	6	1	0	0	0	109
08:00	13	1	0	0	0	0	14	32	2	0	0	0	0	34
08:15	21	2	1	0	0	0	24	38	2	0	0	0	0	40
08:30	45	3	0	0	0	0	48	39	2	0	0	0	0	41
08:45	59	4	0	0	0	0	63	52	0	0	0	0	0	52
Hour	138	10	1	0	0	0	149	161	6	0	0	0	0	167
09:00	21	0	0	0	0	0	21	34	3	0	0	0	0	37
09:15	15	4	1	0	0	0	20	27	1	0	0	0	0	28
09:30	13	1	0	0	0	0	14	18	1	0	0	0	1	20
09:45	13	2	0	0	0	0	15	21	5	0	0	0	0	26
Hour	62	7	1	0	0	0	70	100	10	0	0	0	1	111
10:00	18	2	0	0	0	0	20	14	2	0	0	0	1	17
10:15	17	0	0	0	0	0	17	20	1	0	0	0	0	21
10:30	15	3	1	0	0	1	20	12	2	1	0	0	0	15
10:45	16	0	0	0	0	0	16	27	4	1	0	0	0	32
Hour	66	5	1	0	0	1	73	73	9	2	0	0	1	85
11:00	19	1	1	0	0	0	21	12	0	0	0	0	0	12
11:15	10	1	1	0	0	0	12	20	2	0	0	0	0	22
11:30	18	2	0	0	0	0	20	28	2	0	0	0	0	30
11:45	22	2	0	0	0	0	24	15	0	1	0	0	0	16
Hour	69	6	2	0	0	0	77	75	4	1	0	0	0	80
12:00	16	1	0	0	0	0	17	21	0	0	0	0	0	21
12:15	21	1	0	0	0	0	22	19	2	0	0	0	0	21
12:30	28	2	0	0	0	0	30	9	1	1	0	0	0	11
12:45	20	1	0	0	0	0	21	9	2	0	0	0	0	11
Hour	85	5	0	0	0	0	90	58	5	1	0	0	0	64
13:00	31	3	1	0	0	0	35	20	2	1	0	0	0	23
13:15	27	1	0	0	0	0	28	13	2	1	0	0	0	16
13:30	21	0	0	0	0	0	21	22	2	1	0	0	0	25
13:45	31	0	1	0	0	0	32	25	0	0	0	0	1	26
Hour	110	4	2	0	0	0	116	80	6	3	0	0	1	90
14:00	28	1	0	0	0	0	29	17	3	0	0	0	0	20
14:15	45	1	0	0	0	0	46	17	4	0	0	0	0	21
14:30	25	3	0	0	0	0	28	26	2	0	0	0	0	28
14:45	35	2	0	0	0	0	37	18	0	0	0	0	0	18
Hour	133	7	0	0	0	0	140	78	9	0	0	0	0	87
15:00	23	2	0	0	0	0	25	16	1	0	0	0	0	17
15:15	30	0	0	0	0	0	30	20	2	0	0	0	0	22
15:30	38	3	0	0	0	0	41	26	1	0	0	0	0	27
15:45	36	1	0	0	0	0	37	22	2	0	0	0	0	24
Hour	127	6	0	0	0	0	133	84	6	0	0	0	0	90
16:00	35	6	0	0	0	0	41	13	2	0	0	0	0	15
16:15	37	0	0	0	0	0	37	19	3	0	0	0	0	22
16:30	37	3	1	0	0	0	41	21	3	0	0	0	0	24
16:45	38	3	0	0	0	1	42	28	5	0	0	0	0	33
Hour	147	12	1	0	0	1	161	81	13	0	0	0	0	94
17:00	44	3	0	0	0	0	47	20	1	1	0	0	0	22
17:15	44	2	0	0	0	1	47	18	4	0	0	0	0	22
17:30	53	2	1	0	0	0	56	19	0	0	0	0	0	19
17:45	54	2	0	0	0	0	56	27	1	0	0	0	0	28
Hour	195	9	1	0	0	1	206	84	6	1	0	0	0	91
18:00	42	0	0	0	0	1	43	13	1	0	0	0	0	14
18:15	29	3	0	0	0	0	32	20	0	0	0	0	0	20
18:30	30	3	0	0	0	0	33	21	1	0	0	0	0	22
18:45	27	0	0	0	0	0	27	20	2	0	0	0	0	22
Hour	128	6	0	0	0	1	135	74	4	0	0	0	0	78
Total	1299	87	10	0	0	4	1400	1050	84	9	0	0	3	1146

Site No. 4
Location Harbour Rd(W) / Church St / Harbour Rd(E)
Date Tuesday 26 September 2023

Time	To Arm C - Harbour Rd(E)						Veh. Total	From Arm C - Harbour Rd(E)						Veh. Total
	CAR	LGV	OGV1	OGV2	PSV	M/C		CAR	LGV	OGV1	OGV2	PSV	M/C	
07:00	13	5	0	0	1	0	19	30	4	0	0	0	0	34
07:15	28	6	0	0	1	0	35	44	3	2	0	0	0	49
07:30	26	4	0	0	1	0	31	50	3	0	0	2	0	55
07:45	32	8	1	0	0	0	41	51	1	0	0	1	0	53
Hour	99	23	1	0	3	0	126	175	11	2	0	3	0	191
08:00	16	9	0	0	2	0	27	45	6	1	0	0	0	52
08:15	18	4	1	0	0	0	23	51	1	1	0	0	0	53
08:30	32	4	0	0	0	0	36	53	5	0	0	0	0	58
08:45	47	13	2	0	1	0	63	52	6	0	0	1	0	59
Hour	113	30	3	0	3	0	149	201	18	2	0	1	0	222
09:00	36	8	3	0	0	0	47	66	8	2	0	0	0	76
09:15	47	10	2	0	1	0	60	44	4	2	0	0	0	50
09:30	33	11	1	0	0	0	45	42	11	3	0	1	1	58
09:45	59	11	2	0	1	0	73	41	5	2	0	1	0	49
Hour	175	40	8	0	2	0	225	193	28	9	0	2	1	233
10:00	42	1	0	0	1	0	44	53	8	0	0	0	0	61
10:15	42	9	6	2	0	0	59	33	5	3	0	0	1	42
10:30	43	6	3	0	0	0	52	45	5	2	0	1	0	53
10:45	43	2	1	0	3	0	49	37	9	5	0	0	0	51
Hour	170	18	10	2	4	0	204	168	27	10	0	1	1	207
11:00	48	8	1	0	0	0	57	59	4	1	0	1	0	65
11:15	38	5	3	0	1	0	47	38	4	2	0	0	0	44
11:30	40	8	3	0	0	0	51	48	7	6	0	1	0	62
11:45	54	3	1	1	1	0	60	49	3	2	0	1	1	56
Hour	180	24	8	1	2	0	215	194	18	11	0	3	1	227
12:00	49	11	2	0	1	0	63	54	7	1	0	1	0	63
12:15	55	6	3	0	0	0	64	40	3	5	0	1	0	49
12:30	50	6	0	0	1	0	57	55	7	0	2	0	0	64
12:45	62	6	3	0	1	0	72	60	7	0	0	1	0	68
Hour	216	29	8	0	3	0	256	209	24	6	2	3	0	244
13:00	57	2	2	0	1	1	63	60	9	1	0	0	0	70
13:15	44	1	2	0	0	0	47	43	3	0	0	2	1	49
13:30	50	4	3	1	0	0	58	41	6	3	0	0	0	50
13:45	63	3	3	0	2	1	72	63	4	1	0	0	0	68
Hour	214	10	10	1	3	2	240	207	22	5	0	2	1	237
14:00	45	10	0	0	1	1	57	40	6	3	0	1	1	51
14:15	44	2	1	0	0	0	47	46	6	0	0	1	0	53
14:30	51	6	0	0	1	1	59	49	8	0	0	0	0	57
14:45	51	5	2	0	2	0	60	53	7	0	1	0	1	62
Hour	191	23	3	0	4	2	223	188	27	3	1	2	2	223
15:00	47	4	0	0	1	0	52	40	6	0	0	1	0	47
15:15	63	1	0	0	1	0	65	71	10	3	0	3	0	87
15:30	57	7	1	0	1	0	66	74	11	2	1	0	1	89
15:45	48	4	0	0	2	0	54	53	7	0	0	1	0	61
Hour	215	16	1	0	5	0	237	238	34	5	1	5	1	284
16:00	53	3	0	0	1	1	58	55	8	1	0	0	0	64
16:15	64	5	0	0	0	0	69	52	11	1	0	2	0	66
16:30	59	4	0	0	0	0	63	48	2	1	0	0	1	52
16:45	66	1	0	0	2	0	69	58	5	0	0	0	0	63
Hour	242	13	0	0	3	1	259	213	26	3	0	2	1	245
17:00	55	2	0	0	0	0	57	68	5	0	0	2	0	75
17:15	63	2	0	0	1	0	66	49	2	0	0	2	0	53
17:30	54	3	1	0	0	1	59	37	6	0	0	0	0	43
17:45	69	2	0	0	2	0	73	62	5	0	0	0	1	68
Hour	241	9	1	0	3	1	255	216	18	0	0	4	1	239
18:00	57	4	0	0	0	0	61	45	4	0	0	0	0	49
18:15	53	4	0	0	1	0	58	37	3	0	0	2	0	42
18:30	63	0	0	0	1	0	64	37	2	0	0	0	0	39
18:45	58	5	0	0	1	0	64	43	3	1	0	1	0	48
Hour	231	13	0	0	3	0	247	162	12	1	0	3	0	178
Total	2287	248	53	4	38	6	2636	2364	265	57	4	31	9	2730

APPENDIX 6.2
TRICS UNIT TRIP GENERATION RATES

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

TRICS 7.10.3

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use	03 - RESIDENTIAL
Category	C - FLATS PRIVATELY OWNED
TOTAL VEHICLES	

Selected regions and areas:

1	GREATER LONDON		
	HO	HOUNSLOW	1 days
2	SOUTH EAST		
	BH	BRIGHTON & HOVE	1 days
	HF	HERTFORDSHIRE	3 days
	WS	WEST SUSSEX	1 days
4	EAST ANGLIA		
	CA	CAMBRIDGESHIRE	1 days
	NF	NORFOLK	1 days
	SF	SUFFOLK	1 days
5	EAST MIDLANDS		
	DY	DERBY	1 days
	LE	LEICESTERSHIRE	1 days
	NG	NOTTINGHAM	2 days
9	NORTH		
	TW	TYNE & WEAR	1 days
11	SCOTLAND		
	EB	CITY OF EDINBURGH	1 days
	SR	STIRLING	1 days
13	MUNSTER		
	WA	WATERFORD	1 days
14	LEINSTER		
	LU	LOUTH	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter:	No of Dwellings
Actual Range:	18 to 203 (units:)
Range Selected by User:	50 to 493 (units:)

Public Transport Provision:

Selection by:	Include all surveys

Date Range:	01/01/15 to 20/10/22

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	3 days
Tuesday	6 days
Wednesday	6 days
Thursday	1 days
Friday	2 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	18 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff whilst ATC surveys are undertaken using machines.

Selected Locations:

Town Centre	0
Edge of Town Centre	0
Suburban Area (PPS6 Out of Centre)	9
Edge of Town	4
Neighbourhood Centre (PPS6 Local Centre)	5
Free Standing (PPS6 Out of Town)	0
Not Known	0

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre, and Not Known.

Selected Location Sub Categories:

Industrial Zone	0
Commercial Zone	0
Development Zone	0
Residential Zone	15
Retail Zone	0
Built-Up Zone	0
Village	0
Out of Town	0
High Street	0
No Sub Category	3

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street, and No Sub Category.

Secondary Filtering selection:

Use Class:
C3 18 days
This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order (England) 2020 has been used for this purpose which can be found within the Library module of TRICS®.

Population within 500m Range:
All Surveys Included

Population within 1 mile:
1,001 to 5,000 3 days
5,001 to 10,000 2 days
20,001 to 25,000 7 days
25,001 to 50,000 5 days
50,001 to 100,000 1 days
This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:
50,001 to 75,000 3 days
125,001 to 250,000 8 days
250,001 to 500,000 7 days
This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:
0.5 or Less 1 days
0.6 to 1.0 9 days
1.1 to 1.5 8 days
This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling within a radius of 5-miles of selected survey sites.

Travel Plan:
Yes 4 days
No 14 days
This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:
No PTAL Present 17 days
3 Moderate 1 days
This data displays the number of selected surveys with PTAL Ratings.

Covid-19 Restrictions Yes
At least one survey within the selected data set was undertaken at a time of Covid-19 restrictions.

LIST OF SITES relevant to selection parameters

1 BH-03-C-01 BLOCK OF FLATS BRIGHTON & HOVE
OLD SHOREHAM RD
HOVE
BRIGHTON
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 71
Survey date: TUESDAY 26/09/2017 Survey Type: MANUAL

2 CA-03-C-03 BLOCKS OF FLATS CAMBRIDGESHIRE
CROMWELL ROAD

CAMBRIDGE
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total No of Dwellings: 82
Survey date: MONDAY 18/09/2017 Survey Type: MANUAL

3 DY-03-C-03 BLOCKS OF FLATS DERBY
CAESAR STREET

DERBY
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 30
Survey date: WEDNESDAY 25/09/2019 Survey Type: MANUAL

4 EB-03-C-01 BLOCKS OF FLATS CITY OF EDINBURGH
MYRESIDE ROAD
CRAIGLOCKHART
EDINBURGH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 32
Survey date: TUESDAY 26/05/2015 Survey Type: MANUAL

5 HF-03-C-01 BLOCKS OF FLATS HERTFORDSHIRE
HAYLING ROAD
SOUTH OXHEY
WATFORD
Edge of Town
Residential Zone
Total No of Dwellings: 22
Survey date: WEDNESDAY 09/06/2021 Survey Type: MANUAL

6 HF-03-C-04 BLOCKS OF FLATS HERTFORDSHIRE
OXHEY DRIVE
SOUTH OXHEY
WATFORD
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total No of Dwellings: 84
Survey date: THURSDAY 10/06/2021 Survey Type: MANUAL

7 HF-03-C-05 BLOCKS OF FLATS HERTFORDSHIRE
FERNDOWN ROAD
SOUTH OXHEY
WATFORD
Edge of Town
Residential Zone
Total No of Dwellings: 26
Survey date: MONDAY 07/06/2021 Survey Type: MANUAL

8 HO-03-C-04 BLOCKS OF FLATS HOUNSLOW
LONDON ROAD
ISLEWORTH
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total No of Dwellings: 203
Survey date: TUESDAY 03/07/2018 Survey Type: MANUAL

9 LE-03-C-01 BLOCK OF FLATS LEICESTERSHIRE
NEW STREET
OADBY
LEICESTER
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total No of Dwellings: 19
Survey date: FRIDAY 16/10/2020 Survey Type: MANUAL

10 LU-03-C-04 BLOCKS OF FLATS LOUTH
RIVER COURT
DROGHEDA
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total No of Dwellings: 42
Survey date: WEDNESDAY 22/09/2021 Survey Type: MANUAL

11 NF-03-C-02 MIXED FLATS & HOUSES NORFOLK
HALL ROAD
LAKENHAM
NORWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 82
Survey date: MONDAY 18/11/2019 Survey Type: MANUAL

12 NG-03-C-01 HOUSES (SPLIT INTO FLATS) NOTTINGHAM
LAWRENCE WAY
NOTTINGHAM
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total No of Dwellings: 56
Survey date: TUESDAY 08/11/2016 Survey Type: MANUAL

13 NG-03-C-02 HOUSES (SPLIT INTO FLATS) NOTTINGHAM
CASTLE MARINA ROAD
NOTTINGHAM
Suburban Area (PPS6 Out of Centre)
No Sub Category
Total No of Dwellings: 135
Survey date: WEDNESDAY 09/11/2016 Survey Type: MANUAL

14 SF-03-C-04 BLOCKS OF FLATS SUFFOLK
SAINT MARY'S ROAD
IPSWICH
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 56
Survey date: WEDNESDAY 16/09/2020 Survey Type: MANUAL

15 SR-03-C-03 BLOCK OF FLATS & TERRACED STIRLING
KERSEBONNY ROAD
CAMBUSBARRON
STIRLING
Edge of Town
Residential Zone
Total No of Dwellings: 82
Survey date: TUESDAY 01/09/2020 Survey Type: MANUAL

16 TW-03-C-01 BLOCKS OF FLATS TYNE & WEAR
CAULDWELL AVENUE
MONKESEATON
WHITLEY BAY
Edge of Town
Residential Zone
Total No of Dwellings: 45
Survey date: FRIDAY 15/10/2021 Survey Type: MANUAL

17 WA-03-C-01 BLOCKS OF FLATS WATERFORD
UPPER YELLOW ROAD
WATERFORD
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 51
Survey date: TUESDAY 12/05/2015 Survey Type: MANUAL

18 WS-03-C-01 BLOCKS OF FLATS WEST SUSSEX
GORING ROAD
GORING-BY-SEA
WORTHING
Neighbourhood Centre (PPS6 Local Centre)
Residential Zone
Total No of Dwellings: 18
Survey date: WEDNESDAY 11/05/2022 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site it displays a unique site reference code and site address the selected trip rate calculation parameter and its value the day of the week and date of each survey and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: TOTAL VEHICLES

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	18	63	0.04	18	63	0.129	18	63	0.169
08:00-09:00	18	63	0.056	18	63	0.165	18	63	0.221
09:00-10:00	18	63	0.081	18	63	0.092	18	63	0.173
10:00-11:00	18	63	0.072	18	63	0.097	18	63	0.169
11:00-12:00	18	63	0.069	18	63	0.073	18	63	0.142
12:00-13:00	18	63	0.085	18	63	0.091	18	63	0.176
13:00-14:00	18	63	0.074	18	63	0.088	18	63	0.162
14:00-15:00	18	63	0.084	18	63	0.085	18	63	0.169
15:00-16:00	18	63	0.105	18	63	0.079	18	63	0.184
16:00-17:00	18	63	0.125	18	63	0.085	18	63	0.21
17:00-18:00	18	63	0.155	18	63	0.074	18	63	0.229
18:00-19:00	18	63	0.121	18	63	0.088	18	63	0.209
19:00-20:00	1	203	0.113	1	203	0.064	1	203	0.177
20:00-21:00	1	203	0.069	1	203	0.049	1	203	0.118
21:00-22:00									
22:00-23:00									
23:00-24:00									
Daily Trip Rates:			1.249			1.259			2.508

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: TAXIS

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	18	63	0.005	18	63	0.005	18	63	0.01
08:00-09:00	18	63	0.006	18	63	0.006	18	63	0.012
09:00-10:00	18	63	0.006	18	63	0.005	18	63	0.011
10:00-11:00	18	63	0.005	18	63	0.006	18	63	0.011
11:00-12:00	18	63	0.003	18	63	0.003	18	63	0.006
12:00-13:00	18	63	0.009	18	63	0.007	18	63	0.016
13:00-14:00	18	63	0.002	18	63	0.004	18	63	0.006
14:00-15:00	18	63	0.002	18	63	0.002	18	63	0.004
15:00-16:00	18	63	0.003	18	63	0.003	18	63	0.006
16:00-17:00	18	63	0.003	18	63	0.003	18	63	0.006
17:00-18:00	18	63	0.001	18	63	0.001	18	63	0.002
18:00-19:00	18	63	0.003	18	63	0.003	18	63	0.006
19:00-20:00	1	203	0.005	1	203	0.005	1	203	0.01
20:00-21:00	1	203	0	1	203	0	1	203	0
21:00-22:00									
22:00-23:00									
23:00-24:00									
Daily Trip Rates:			0.053			0.053			0.106

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: OGVS

			ARRIVALS			DEPARTURES			TOTALS
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00		18	63	0.001	18	63	0	18	63	0.001
08:00-09:00		18	63	0.002	18	63	0.001	18	63	0.003
09:00-10:00		18	63	0.004	18	63	0.002	18	63	0.006
10:00-11:00		18	63	0.007	18	63	0.005	18	63	0.012
11:00-12:00		18	63	0.001	18	63	0.004	18	63	0.005
12:00-13:00		18	63	0.003	18	63	0.003	18	63	0.006
13:00-14:00		18	63	0	18	63	0	18	63	0
14:00-15:00		18	63	0.001	18	63	0.003	18	63	0.004
15:00-16:00		18	63	0.001	18	63	0	18	63	0.001
16:00-17:00		18	63	0.002	18	63	0.002	18	63	0.004
17:00-18:00		18	63	0	18	63	0.001	18	63	0.001
18:00-19:00		18	63	0	18	63	0	18	63	0
19:00-20:00		1	203	0	1	203	0	1	203	0
20:00-21:00		1	203	0	1	203	0	1	203	0
21:00-22:00									
22:00-23:00									
23:00-24:00									
Daily Trip Rates:				0.022			0.021			0.043

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: PSVS

			ARRIVALS			DEPARTURES			TOTALS
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00		18	63	0	18	63	0	18	63	0
08:00-09:00		18	63	0	18	63	0	18	63	0
09:00-10:00		18	63	0	18	63	0	18	63	0
10:00-11:00		18	63	0	18	63	0	18	63	0
11:00-12:00		18	63	0	18	63	0	18	63	0
12:00-13:00		18	63	0	18	63	0	18	63	0
13:00-14:00		18	63	0	18	63	0	18	63	0
14:00-15:00		18	63	0.001	18	63	0.001	18	63	0.002
15:00-16:00		18	63	0	18	63	0	18	63	0
16:00-17:00		18	63	0.001	18	63	0.001	18	63	0.002
17:00-18:00		18	63	0	18	63	0	18	63	0
18:00-19:00		18	63	0	18	63	0	18	63	0
19:00-20:00		1	203	0	1	203	0	1	203	0
20:00-21:00		1	203	0	1	203	0	1	203	0
21:00-22:00									
22:00-23:00									
23:00-24:00									
Daily Trip Rates:				0.002			0.002			0.004

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: CYCLISTS

			ARRIVALS			DEPARTURES			TOTALS
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00		18	63	0.002	18	63	0.021	18	63	0.023
08:00-09:00		18	63	0.001	18	63	0.025	18	63	0.026
09:00-10:00		18	63	0.004	18	63	0.004	18	63	0.008
10:00-11:00		18	63	0.005	18	63	0.002	18	63	0.007
11:00-12:00		18	63	0.008	18	63	0.002	18	63	0.01
12:00-13:00		18	63	0.004	18	63	0.005	18	63	0.009
13:00-14:00		18	63	0.006	18	63	0.003	18	63	0.009
14:00-15:00		18	63	0.01	18	63	0.006	18	63	0.016
15:00-16:00		18	63	0.004	18	63	0.002	18	63	0.006
16:00-17:00		18	63	0.006	18	63	0.004	18	63	0.01
17:00-18:00		18	63	0.011	18	63	0.004	18	63	0.015
18:00-19:00		18	63	0.008	18	63	0.005	18	63	0.013
19:00-20:00		1	203	0	1	203	0	1	203	0
20:00-21:00		1	203	0.005	1	203	0	1	203	0.005
21:00-22:00									

22:00-23:00										
23:00-24:00										
Daily Trip Rates:				0.074			0.083			0.157

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: CARS

			ARRIVALS				DEPARTURES			TOTALS
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00										
01:00-02:00										
02:00-03:00										
03:00-04:00										
04:00-05:00										
05:00-06:00										
06:00-07:00										
07:00-08:00	18	63	0.03	18	63	0.114	18	63	0.144	
08:00-09:00	18	63	0.042	18	63	0.15	18	63	0.192	
09:00-10:00	18	63	0.057	18	63	0.081	18	63	0.138	
10:00-11:00	18	63	0.049	18	63	0.068	18	63	0.117	
11:00-12:00	18	63	0.055	18	63	0.054	18	63	0.109	
12:00-13:00	18	63	0.058	18	63	0.068	18	63	0.126	
13:00-14:00	18	63	0.061	18	63	0.069	18	63	0.13	
14:00-15:00	18	63	0.071	18	63	0.07	18	63	0.141	
15:00-16:00	18	63	0.087	18	63	0.063	18	63	0.15	
16:00-17:00	18	63	0.108	18	63	0.07	18	63	0.178	
17:00-18:00	18	63	0.138	18	63	0.062	18	63	0.2	
18:00-19:00	18	63	0.108	18	63	0.075	18	63	0.183	
19:00-20:00	1	203	0.064	1	203	0.044	1	203	0.108	
20:00-21:00	1	203	0.059	1	203	0.044	1	203	0.103	
21:00-22:00										
22:00-23:00										
23:00-24:00										
Daily Trip Rates:			1.007			1.032			2.039	

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: LGVS

			ARRIVALS				DEPARTURES			TOTALS
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00										
01:00-02:00										
02:00-03:00										
03:00-04:00										
04:00-05:00										
05:00-06:00										
06:00-07:00										
07:00-08:00	18	63	0.004	18	63	0.011	18	63	0.015	
08:00-09:00	18	63	0.006	18	63	0.007	18	63	0.013	
09:00-10:00	18	63	0.014	18	63	0.004	18	63	0.018	
10:00-11:00	18	63	0.011	18	63	0.017	18	63	0.028	
11:00-12:00	18	63	0.01	18	63	0.012	18	63	0.022	
12:00-13:00	18	63	0.014	18	63	0.011	18	63	0.025	
13:00-14:00	18	63	0.009	18	63	0.014	18	63	0.023	
14:00-15:00	18	63	0.008	18	63	0.01	18	63	0.018	
15:00-16:00	18	63	0.013	18	63	0.011	18	63	0.024	
16:00-17:00	18	63	0.01	18	63	0.009	18	63	0.019	
17:00-18:00	18	63	0.013	18	63	0.007	18	63	0.02	
18:00-19:00	18	63	0.009	18	63	0.008	18	63	0.017	
19:00-20:00	1	203	0.015	1	203	0.01	1	203	0.025	
20:00-21:00	1	203	0.01	1	203	0	1	203	0.01	
21:00-22:00										
22:00-23:00										
23:00-24:00										
Daily Trip Rates:			0.146			0.131			0.277	

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: MOTOR CYCLES

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00-01:00									
01:00-02:00									
02:00-03:00									
03:00-04:00									
04:00-05:00									
05:00-06:00									
06:00-07:00									
07:00-08:00	18	63	0	18	63	0	18	63	0
08:00-09:00	18	63	0	18	63	0.001	18	63	0.001
09:00-10:00	18	63	0	18	63	0	18	63	0
10:00-11:00	18	63	0	18	63	0.001	18	63	0.001
11:00-12:00	18	63	0.001	18	63	0	18	63	0.001
12:00-13:00	18	63	0.001	18	63	0.002	18	63	0.003
13:00-14:00	18	63	0.003	18	63	0.002	18	63	0.005
14:00-15:00	18	63	0.001	18	63	0	18	63	0.001
15:00-16:00	18	63	0.001	18	63	0.002	18	63	0.003
16:00-17:00	18	63	0.002	18	63	0.001	18	63	0.003
17:00-18:00	18	63	0.003	18	63	0.004	18	63	0.007
18:00-19:00	18	63	0.002	18	63	0.003	18	63	0.005
19:00-20:00	1	203	0.01	1	203	0.005	1	203	0.015
20:00-21:00	1	203	0	1	203	0.005	1	203	0.005
21:00-22:00									
22:00-23:00									
23:00-24:00									
Daily Trip Rates:			0.024			0.026			0.05

Parameter summary

Trip rate parameter range selected:	18 - 203 (units:)
Survey date date range:	01/01/15 - 20/10/22
Number of weekdays (Monday-Friday):	18
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first followed by the range of minimum and maximum survey dates selected by the user. Then the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

APPENDIX 6.3
TRAFFIC MODELLING OUTPUTS

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

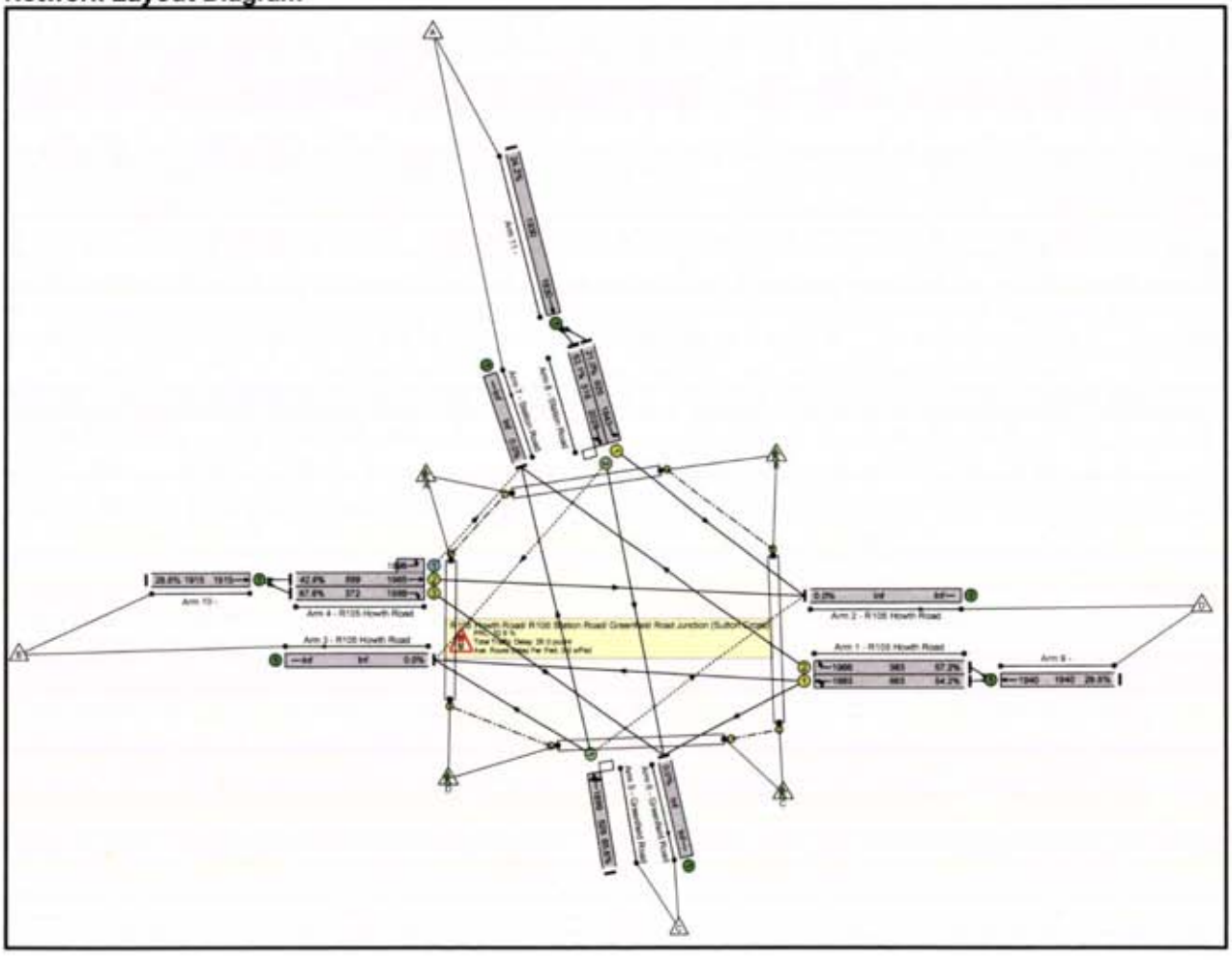
Basic Results Summary

User and Project Details

Project:	**C1009**
Title:	**Existing Layout**
Location:	Sutton Cross Junction
File name:	20231106 Sutton_Cross_Junction V1.10.lsg3x
Author:	NJ
Company:	Transport Insights
Address:	
Notes:	

Scenario 1: 'Base Year: 2023 AM' (FG1: 'Base Year : 2023 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**67.8%**	**30**	**18**	**0**	**26.0**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**67.8%**	**30**	**18**	**0**	**26.0**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	359	1883	663	54.2%	-	-	-	4.1	41.0	12.5
1/2	R105 Howth Road Right	U	E		2	50	-	219	1966	383	57.2%	-	-	-	3.7	60.1	8.7
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	296	1965:1896	689	42.9%	5	18	0	3.0	36.8	9.5
4/3	R105 Howth Road Right	U	B		2	48	-	252	1986	372	67.8%	-	-	-	4.6	65.8	10.6
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	345	1899	526	65.6%	4	0	0	5.1	53.0	13.4
8/1	Station Road Left	U	D		2	132	-	194	1843	925	21.0%	-	-	-	1.2	21.4	4.8
8/2	Station Road Right Ahead	O	C		2	70	-	274	2029	516	53.1%	21	0	0	3.8	50.1	10.1
9/1	Ahead	U	-		-	-	-	578	1940	1940	29.8%	-	-	-	0.2	1.3	0.2
10/1	Ahead	U	-		-	-	-	548	1915	1915	28.6%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	468	1930	1930	24.2%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

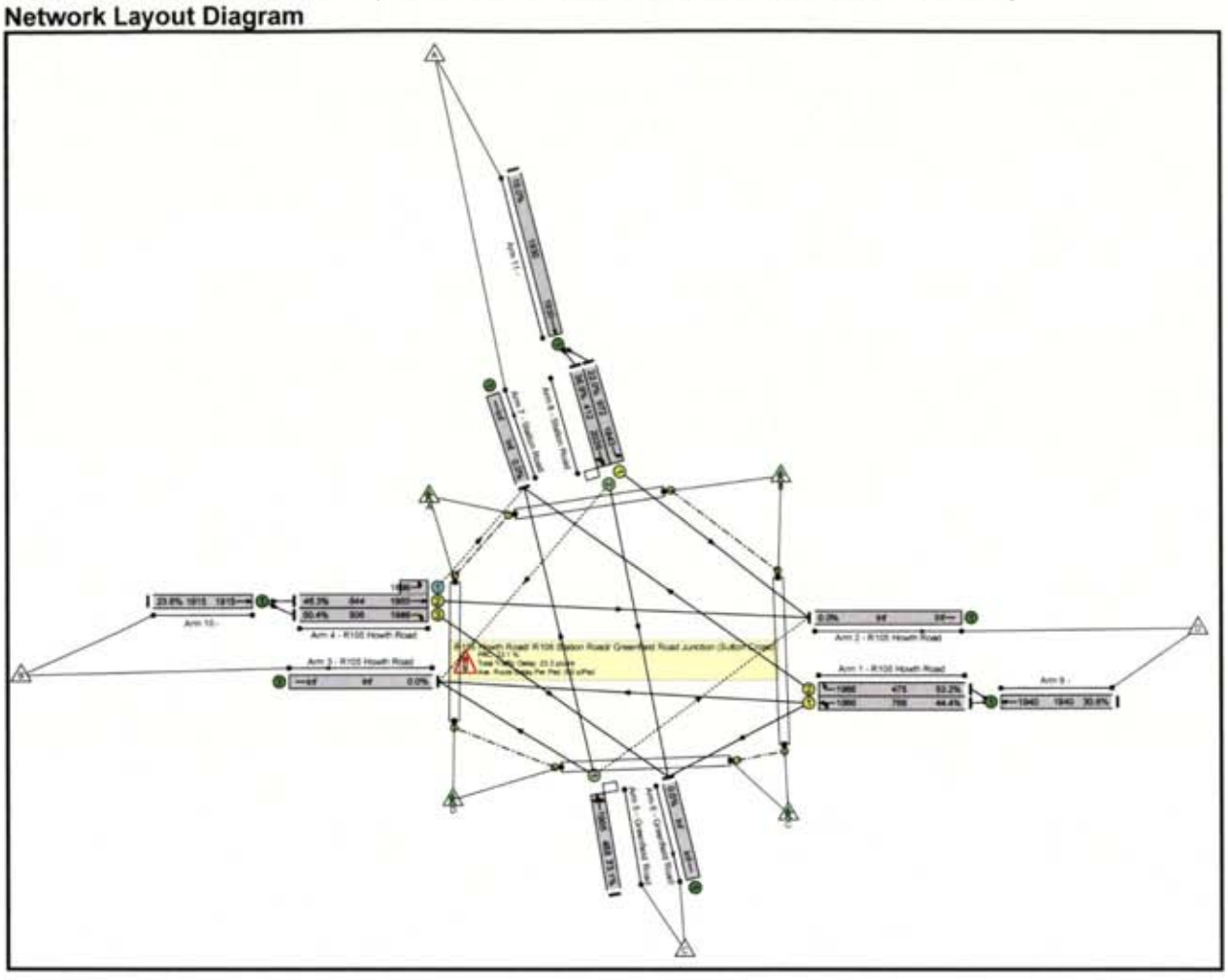
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 32.8 Total Delay for Signalled Lanes (pcuHr): 25.43 Cycle Time (s): 267
PRC Over All Lanes (%): 32.8 Total Delay Over All Lanes(pcuHr): 26.00

Basic Results Summary

Scenario 2: 'Base Year: 2023 PM' (FG2: 'Base Year : 2023 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**73.1%**	**22**	**12**	**0**	**23.0**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**73.1%**	**22**	**12**	**0**	**23.0**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	340	1866	766	44.4%	-	-	-	3.2	33.7	10.9
1/2	R105 Howth Road Right	U	E		2	64	-	253	1966	475	53.2%	-	-	-	3.8	53.6	9.7
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	298	1965:1896	644	46.3%	4	12	0	3.4	41.2	10.2
4/3	R105 Howth Road Right	U	B		2	40	-	154	1986	306	50.4%	-	-	-	2.8	65.3	6.4
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	357	1905	488	73.1%	4	0	0	6.0	60.4	14.9
8/1	Station Road Left	U	D		2	142	-	214	1843	972	22.0%	-	-	-	1.2	20.1	5.1
8/2	Station Road Right Ahead	O	C		2	66	-	152	2026	412	36.9%	14	0	0	2.1	50.6	5.4
9/1	Ahead	U	-		-	-	-	593	1940	1940	30.6%	-	-	-	0.2	1.3	0.2
10/1	Ahead	U	-		-	-	-	452	1915	1915	23.6%	-	-	-	0.2	1.2	0.2
11/1	Ahead	U	-		-	-	-	366	1930	1930	19.0%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

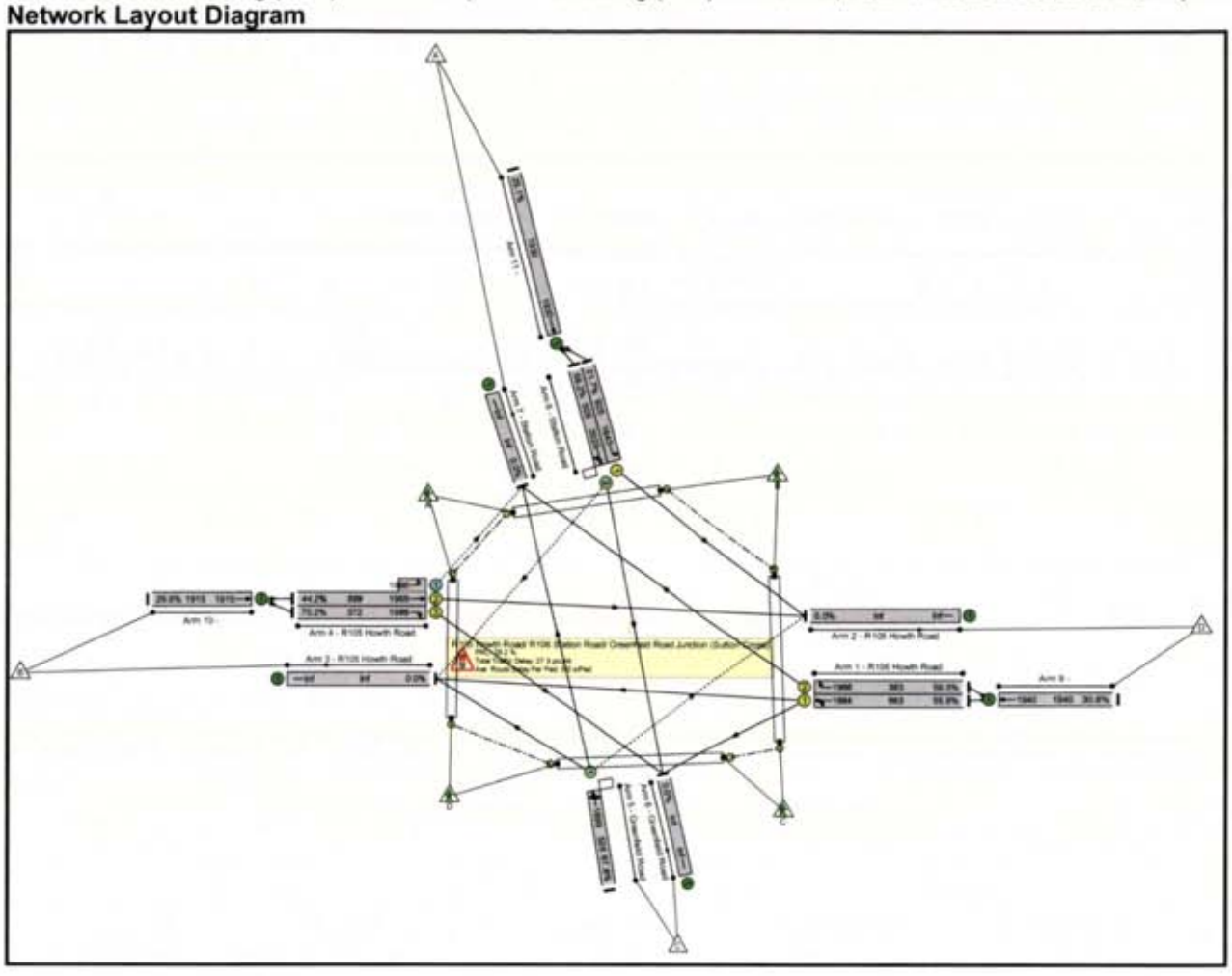
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 23.1 Total Delay for Signalled Lanes (pcuHr): 22.47 Cycle Time (s): 273
PRC Over All Lanes (%): 23.1 Total Delay Over All Lanes(pcuHr): 22.96

Basic Results Summary

Scenario 3: 'Do Nothing (YoO) : 2025 AM' (FG3: 'Do Nothing (YoO) : 2025 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**18**	**0**	**27.3**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**18**	**0**	**27.3**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	371	1884	663	55.9%	-	-	-	4.3	41.5	13.0
1/2	R105 Howth Road Right	U	E		2	50	-	227	1966	383	59.3%	-	-	-	3.8	60.8	9.1
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	305	1965:1896	689	44.2%	5	18	0	3.2	37.2	9.8
4/3	R105 Howth Road Right	U	B		2	48	-	261	1986	372	70.2%	-	-	-	4.9	67.2	11.2
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	357	1899	526	67.8%	4	0	0	5.4	54.0	14.0
8/1	Station Road Left	U	D		2	132	-	201	1843	925	21.7%	-	-	-	1.2	21.5	4.9
8/2	Station Road Right Ahead	O	C		2	70	-	284	2029	505	56.2%	22	0	0	4.0	51.1	10.5
9/1	Ahead	U	-		-	-	-	598	1940	1940	30.8%	-	-	-	0.2	1.3	0.2
10/1	Ahead	U	-		-	-	-	566	1915	1915	29.6%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	485	1930	1930	25.1%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

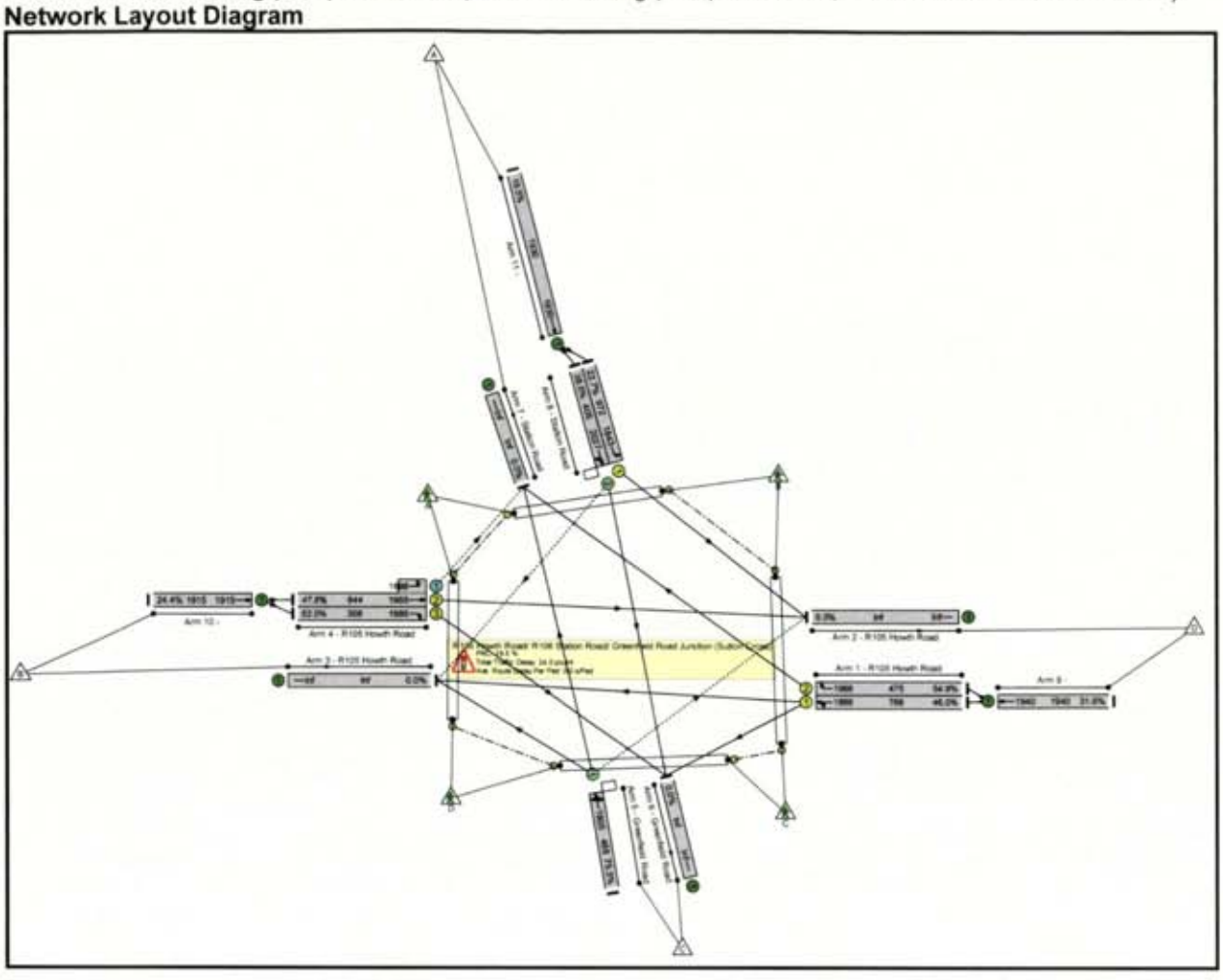
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 28.2 Total Delay for Signalled Lanes (pcuHr): 26.73 Cycle Time (s): 267
PRC Over All Lanes (%): 28.2 Total Delay Over All Lanes(pcuHr): 27.33

Basic Results Summary

Scenario 4: 'Do Nothing (YoO) : 2025 PM' (FG4: 'Do Nothing (YoO) : 2025 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**75.3%**	**22**	**13**	**0**	**24.0**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**75.3%**	**22**	**13**	**0**	**24.0**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	352	1866	766	46.0%	-	-	-	3.3	34.1	11.4
1/2	R105 Howth Road Right	U	E		2	64	-	261	1966	475	54.9%	-	-	-	3.9	54.1	10.1
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	308	1965:1896	644	47.8%	4	13	0	3.6	41.5	10.6
4/3	R105 Howth Road Right	U	B		2	40	-	159	1986	306	52.0%	-	-	-	2.9	65.8	6.6
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	368	1905	488	75.3%	4	0	0	6.3	61.9	15.6
8/1	Station Road Left	U	D		2	142	-	221	1843	972	22.7%	-	-	-	1.2	20.2	5.4
8/2	Station Road Right Ahead	O	C		2	66	-	156	2027	405	38.5%	14	0	0	2.2	51.0	5.6
9/1	Ahead	U	-		-	-	-	613	1940	1940	31.6%	-	-	-	0.2	1.4	0.2
10/1	Ahead	U	-		-	-	-	467	1915	1915	24.4%	-	-	-	0.2	1.2	0.2
11/1	Ahead	U	-		-	-	-	377	1930	1930	19.5%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

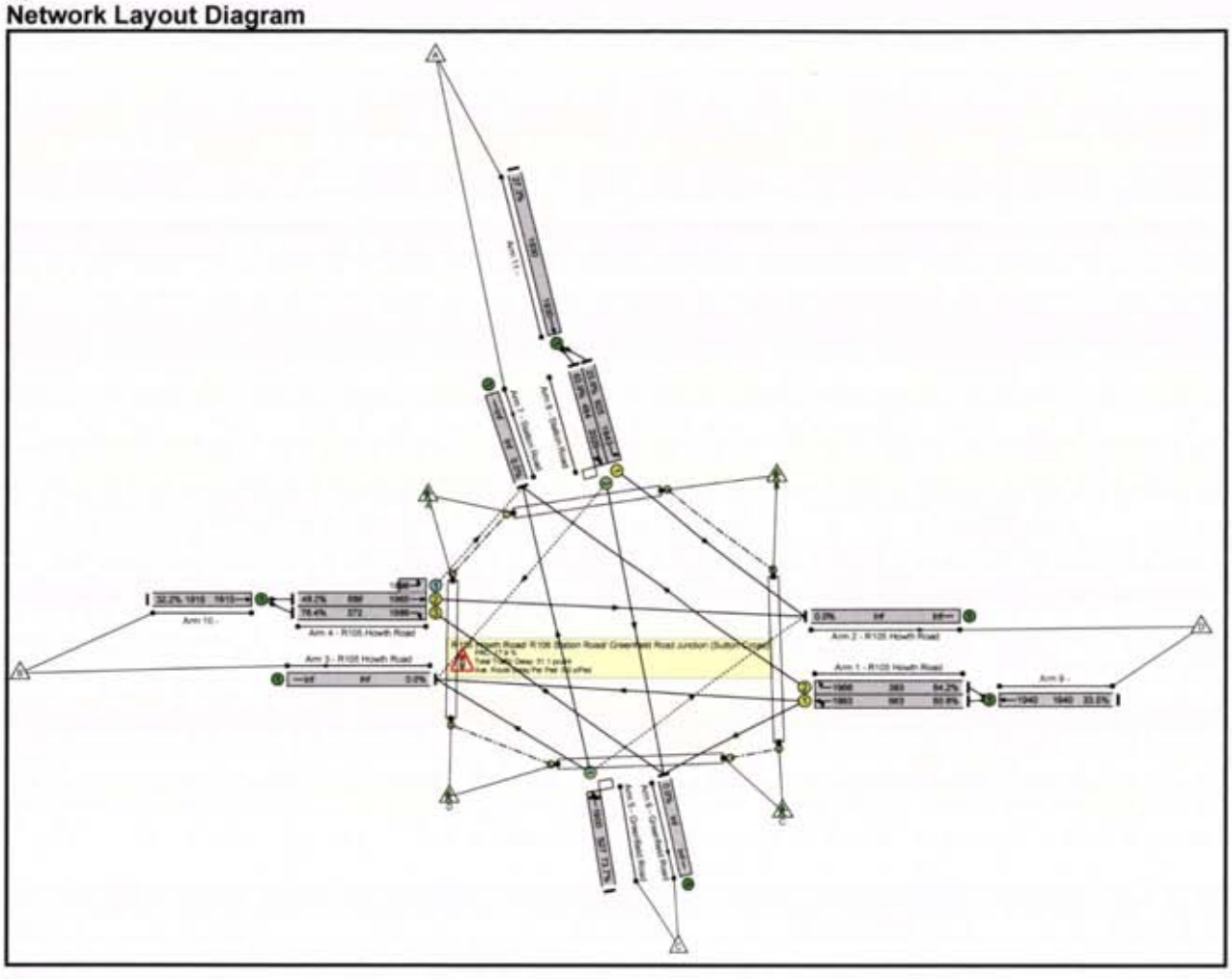
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 19.5 Total Delay for Signalled Lanes (pcuHr): 23.49 Cycle Time (s): 273
PRC Over All Lanes (%): 19.5 Total Delay Over All Lanes(pcuHr): 24.00

Basic Results Summary

Scenario 5: 'Do Nothing (YoO+5) : 2030 AM' (FG5: 'Do Nothing (YoO+5) : 2030 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**76.4%**	**33**	**20**	**0**	**31.1**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**76.4%**	**33**	**20**	**0**	**31.1**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	403	1883	663	60.8%	-	-	-	4.8	43.1	14.5
1/2	R105 Howth Road Right	U	E		2	50	-	246	1966	383	64.2%	-	-	-	4.3	62.9	10.0
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	332	1965:1896	689	48.2%	5	20	0	3.5	38.2	10.9
4/3	R105 Howth Road Right	U	B		2	48	-	284	1986	372	76.4%	-	-	-	5.7	71.8	12.6
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	388	1900	527	73.7%	4	0	0	6.2	57.1	15.8
8/1	Station Road Left	U	D		2	132	-	218	1843	925	23.6%	-	-	-	1.3	21.8	5.4
8/2	Station Road Right Ahead	O	C		2	70	-	309	2029	484	63.9%	24	0	0	4.6	53.9	11.9
9/1	Ahead	U	-		-	-	-	649	1940	1940	33.5%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	616	1915	1915	32.2%	-	-	-	0.2	1.4	0.2
11/1	Ahead	U	-		-	-	-	527	1930	1930	27.3%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

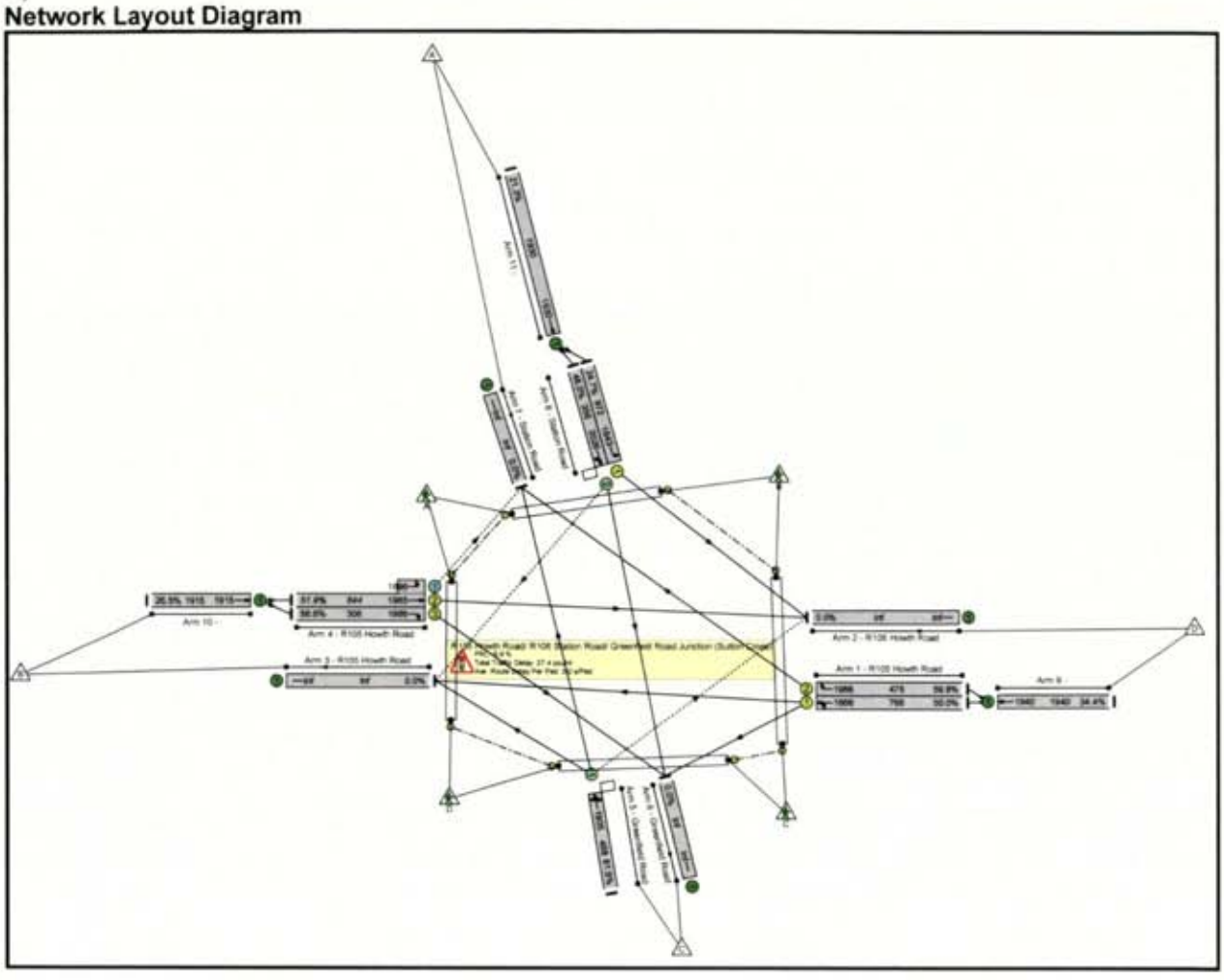
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 17.9 Total Delay for Signalled Lanes (pcuHr): 30.42 Cycle Time (s): 267
PRC Over All Lanes (%): 17.9 Total Delay Over All Lanes(pcuHr): 31.09

Basic Results Summary

Scenario 6: 'Do Nothing (YoO+5) : 2030 PM' (FG6: 'Do Nothing (YoO+5) : 2030 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**81.9%**	**24**	**14**	**0**	**27.4**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**81.9%**	**24**	**14**	**0**	**27.4**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	383	1866	766	50.0%	-	-	-	3.7	35.1	12.6
1/2	R105 Howth Road Right	U	E		2	64	-	284	1966	475	59.8%	-	-	-	4.4	55.7	11.2
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	334	1965:1896	644	51.9%	4	14	0	4.0	42.6	11.8
4/3	R105 Howth Road Right	U	B		2	40	-	173	1986	306	56.6%	-	-	-	3.2	67.5	7.3
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	400	1905	488	81.9%	4	0	0	7.5	67.7	17.8
8/1	Station Road Left	U	D		2	142	-	240	1843	972	24.7%	-	-	-	1.4	20.4	5.9
8/2	Station Road Right Ahead	O	C		2	66	-	171	2026	356	48.0%	16	0	0	2.6	54.1	6.3
9/1	Ahead	U	-		-	-	-	667	1940	1940	34.4%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	507	1915	1915	26.5%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	411	1930	1930	21.3%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

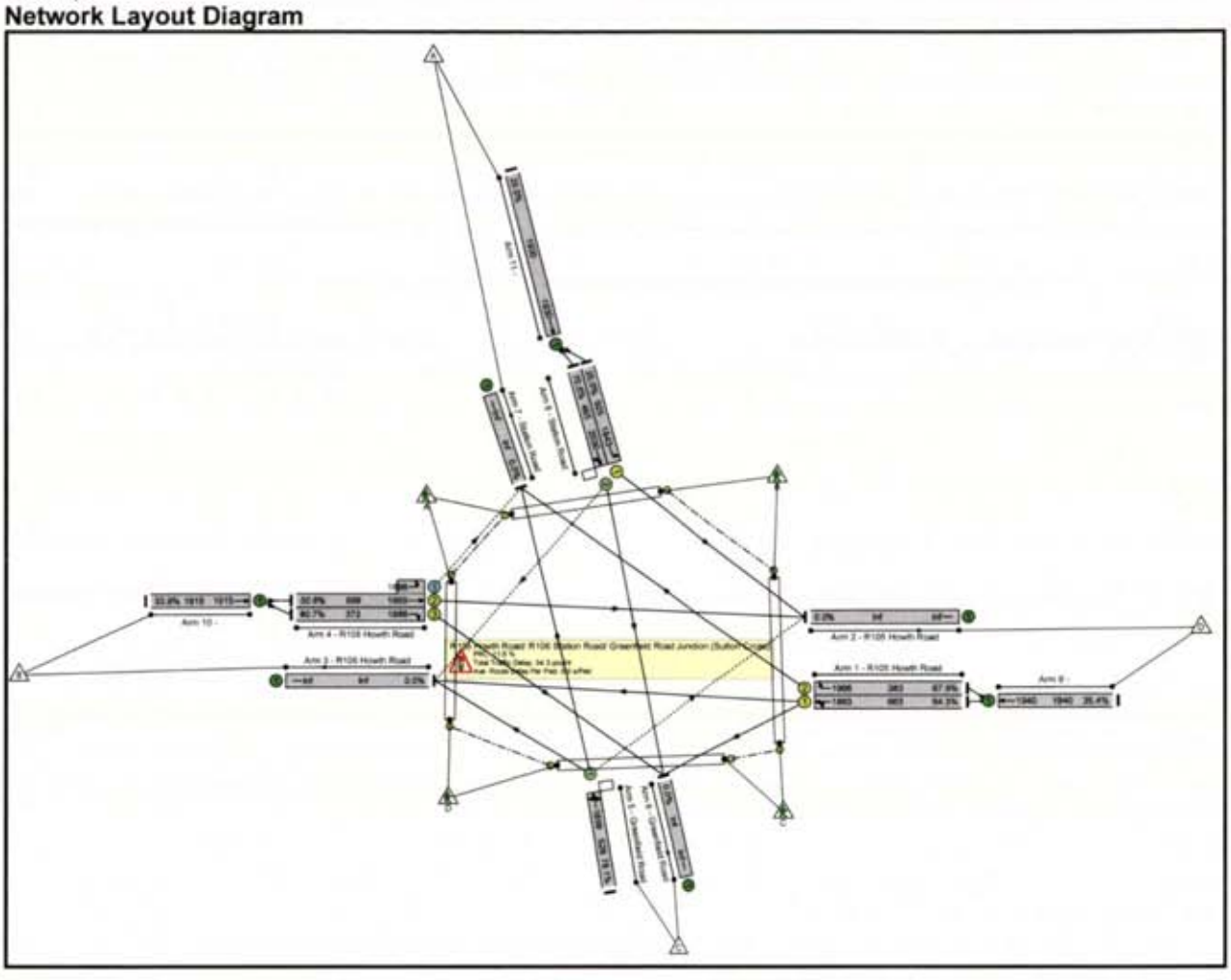
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 9.9 Total Delay for Signalled Lanes (pcuHr): 26.78 Cycle Time (s): 273
PRC Over All Lanes (%): 9.9 Total Delay Over All Lanes(pcuHr): 27.36

Basic Results Summary

Scenario 7: 'Do Nothing (YoO+15) : 2040 AM' (FG7: 'Do Nothing (YoO+15) : 2040 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**34.3**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**34.3**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	426	1883	663	64.3%	-	-	-	5.2	44.3	15.7
1/2	R105 Howth Road Right	U	E		2	50	-	260	1966	383	67.9%	-	-	-	4.7	64.8	10.8
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	350	1965:1896	689	50.8%	5	22	0	3.8	38.8	11.8
4/3	R105 Howth Road Right	U	B		2	48	-	300	1986	372	80.7%	-	-	-	6.4	76.3	13.7
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	411	1899	526	78.1%	5	0	0	6.9	60.3	17.3
8/1	Station Road Left	U	D		2	132	-	231	1843	925	25.0%	-	-	-	1.4	22.0	5.8
8/2	Station Road Right Ahead	O	C		2	70	-	328	2030	465	70.5%	25	0	0	5.2	57.2	12.9
9/1	Ahead	U	-		-	-	-	686	1940	1940	35.4%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	650	1915	1915	33.9%	-	-	-	0.3	1.4	0.3
11/1	Ahead	U	-		-	-	-	559	1930	1930	29.0%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

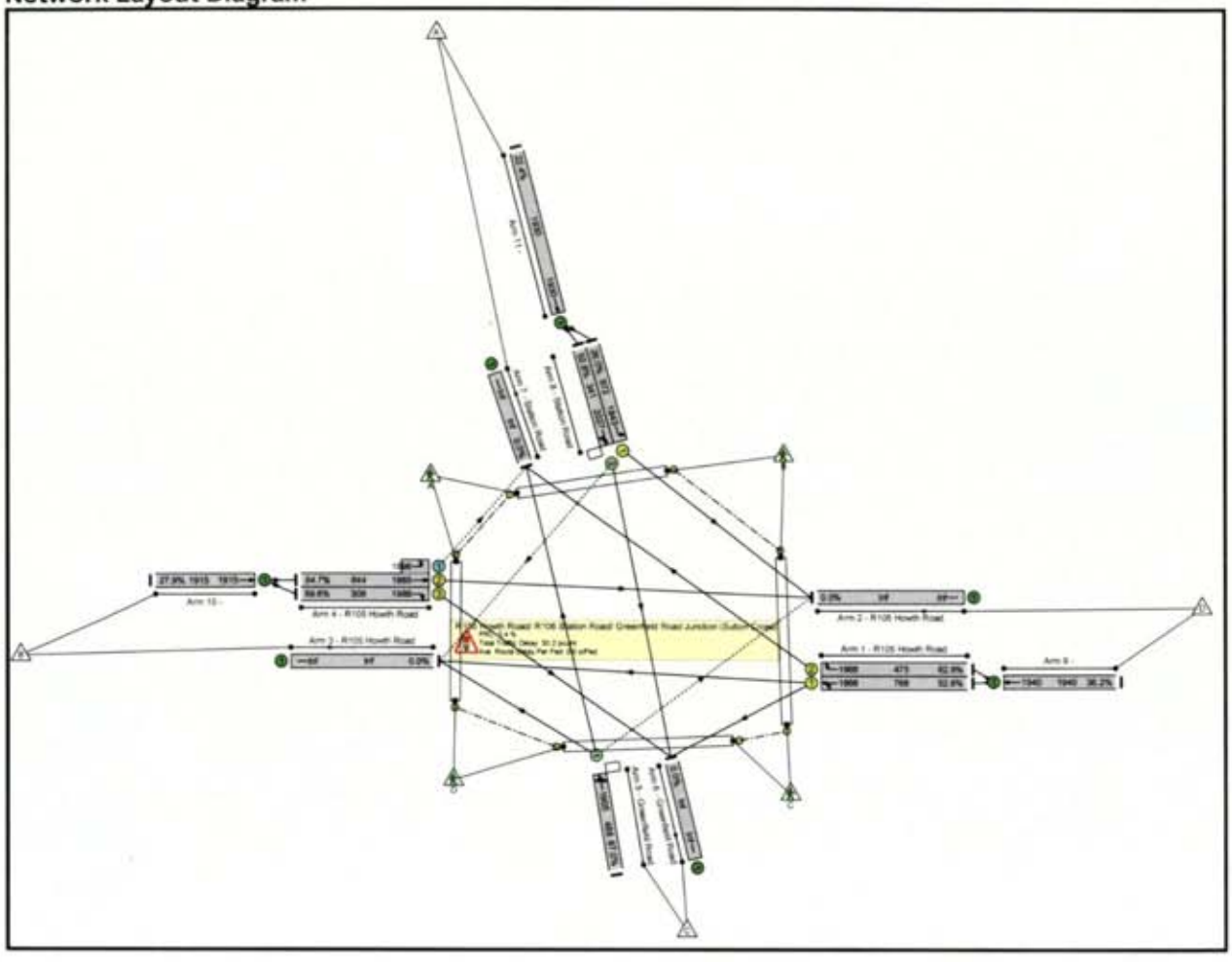
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 11.6 Total Delay for Signalled Lanes (pcuHr): 33.56 Cycle Time (s): 267
PRC Over All Lanes (%): 11.6 Total Delay Over All Lanes(pcuHr): 34.29

Basic Results Summary

Scenario 8: 'Do Nothing (YoO+15) : 2040 PM' (FG8: 'Do Nothing (YoO+15) : 2040 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**87.0%**	**25**	**15**	**0**	**30.2**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**87.0%**	**25**	**15**	**0**	**30.2**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	404	1866	766	52.8%	-	-	-	4.0	35.8	13.6
1/2	R105 Howth Road Right	U	E		2	64	-	299	1966	475	62.9%	-	-	-	4.7	56.9	12.0
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	352	1965:1896	644	54.7%	4	15	0	4.2	43.5	12.6
4/3	R105 Howth Road Right	U	B		2	40	-	182	1986	306	59.6%	-	-	-	3.5	68.7	7.8
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	425	1905	488	87.0%	5	0	0	8.9	75.0	20.1
8/1	Station Road Left	U	D		2	142	-	253	1843	972	26.0%	-	-	-	1.5	20.6	6.2
8/2	Station Road Right Ahead	O	C		2	66	-	180	2027	341	52.8%	16	0	0	2.8	55.8	6.8
9/1	Ahead	U	-		-	-	-	703	1940	1940	36.2%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	534	1915	1915	27.9%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	433	1930	1930	22.4%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

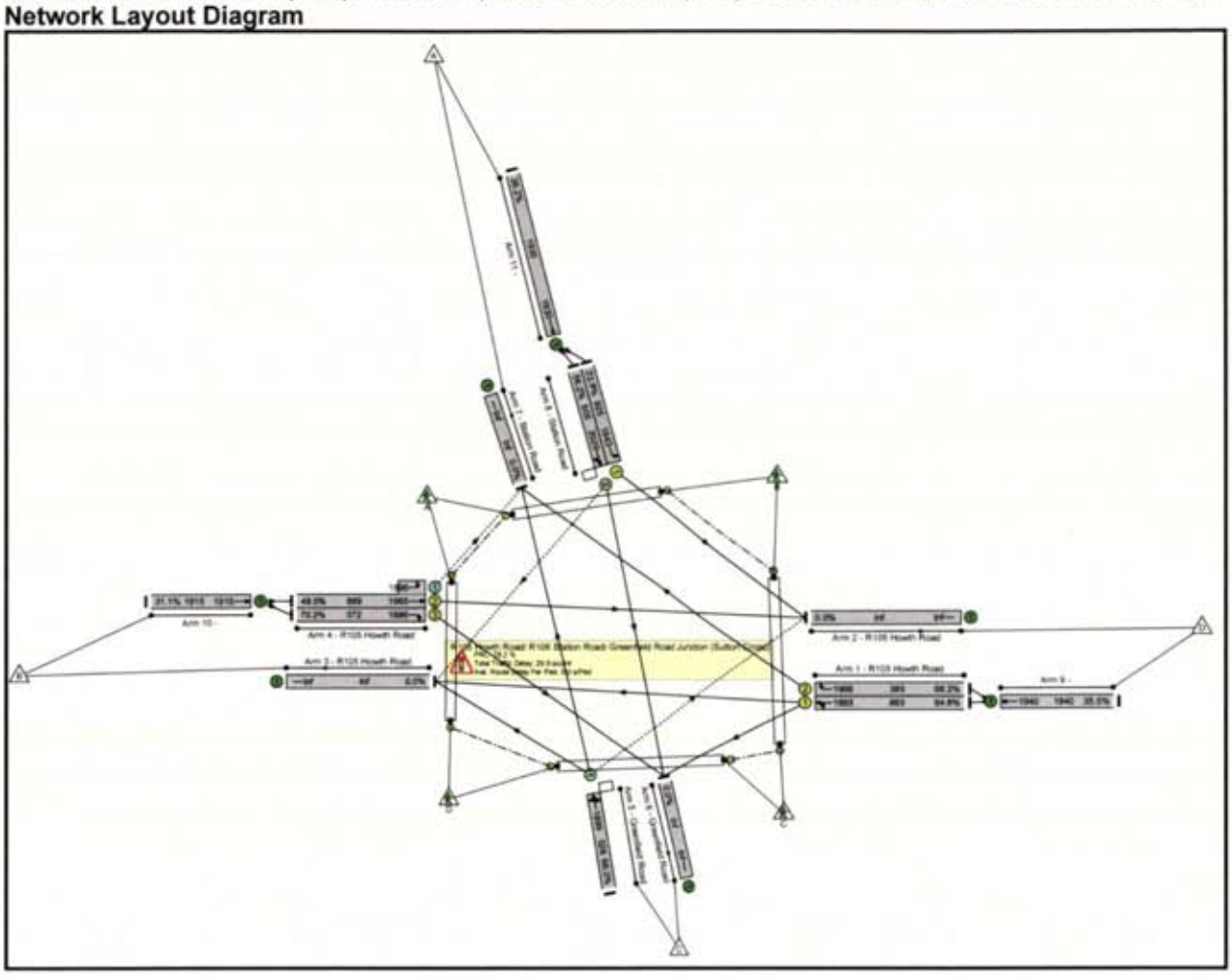
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 3.4 Total Delay for Signalled Lanes (pcuHr): 29.56 Cycle Time (s): 273
PRC Over All Lanes (%): 3.4 Total Delay Over All Lanes(pcuHr): 30.18

Basic Results Summary

Scenario 9: 'Do Minimum (YoO) : 2025 AM' (FG9: 'Do Minimum (YoO): 2025 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**19**	**0**	**29.9**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**19**	**0**	**29.9**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	428	1883	663	64.6%	-	-	-	5.3	44.4	15.8
1/2	R105 Howth Road Right	U	E		2	50	-	261	1966	383	68.2%	-	-	-	4.7	64.9	10.9
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	334	1965:1896	689	48.5%	4	19	0	3.6	38.4	11.2
4/3	R105 Howth Road Right	U	B		2	48	-	261	1986	372	70.2%	-	-	-	4.9	67.2	11.2
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	358	1899	526	68.0%	5	0	0	5.4	54.1	14.1
8/1	Station Road Left	U	D		2	132	-	221	1843	925	23.9%	-	-	-	1.3	21.9	5.5
8/2	Station Road Right Ahead	O	C		2	70	-	284	2029	505	56.2%	22	0	0	4.0	51.1	10.5
9/1	Ahead	U	-		-	-	-	689	1940	1940	35.5%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	595	1915	1915	31.1%	-	-	-	0.2	1.4	0.2
11/1	Ahead	U	-		-	-	-	505	1930	1930	26.2%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

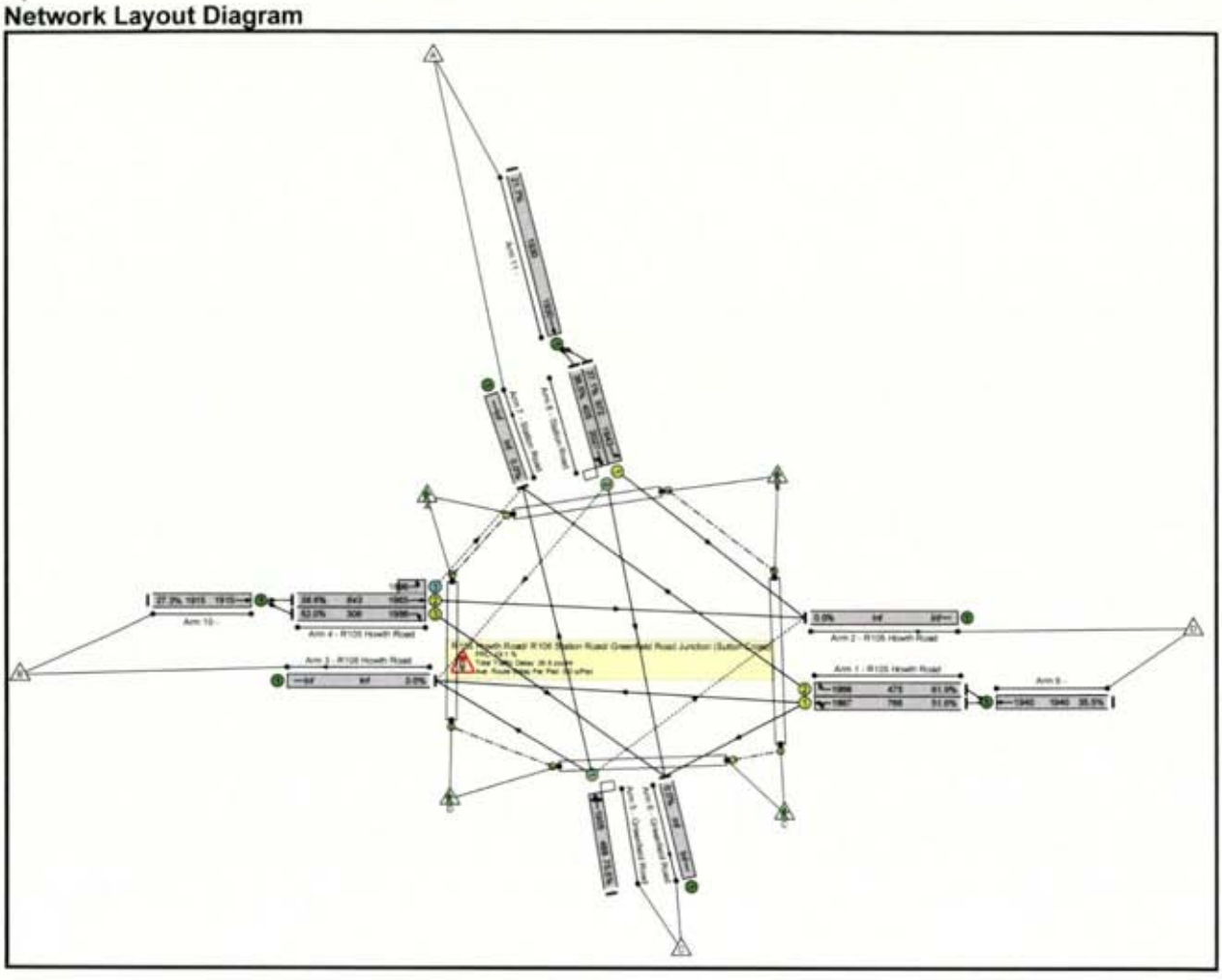
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 28.2 Total Delay for Signalled Lanes (pcuHr): 29.18 Cycle Time (s): 267
PRC Over All Lanes (%): 28.2 Total Delay Over All Lanes(pcuHr): 29.85

Basic Results Summary

Scenario 10: 'Do Minimum (YoO) : 2025 PM' (FG10: 'Do Minimum (YoO): 2025 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**75.5%**	**22**	**14**	**0**	**26.6**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**75.5%**	**22**	**14**	**0**	**26.6**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	395	1867	766	51.6%	-	-	-	3.9	35.5	13.1
1/2	R105 Howth Road Right	U	E		2	64	-	294	1966	475	61.9%	-	-	-	4.6	56.5	11.7
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	364	1965:1896	643	56.6%	3	14	0	4.5	44.2	13.2
4/3	R105 Howth Road Right	U	B		2	40	-	159	1986	306	52.0%	-	-	-	2.9	65.8	6.6
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	369	1905	488	75.5%	5	0	0	6.4	62.0	15.7
8/1	Station Road Left	U	D		2	142	-	263	1843	972	27.1%	-	-	-	1.5	20.8	6.5
8/2	Station Road Right Ahead	O	C		2	66	-	156	2027	405	38.5%	14	0	0	2.2	51.0	5.6
9/1	Ahead	U	-		-	-	-	689	1940	1940	35.5%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	523	1915	1915	27.3%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	419	1930	1930	21.7%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

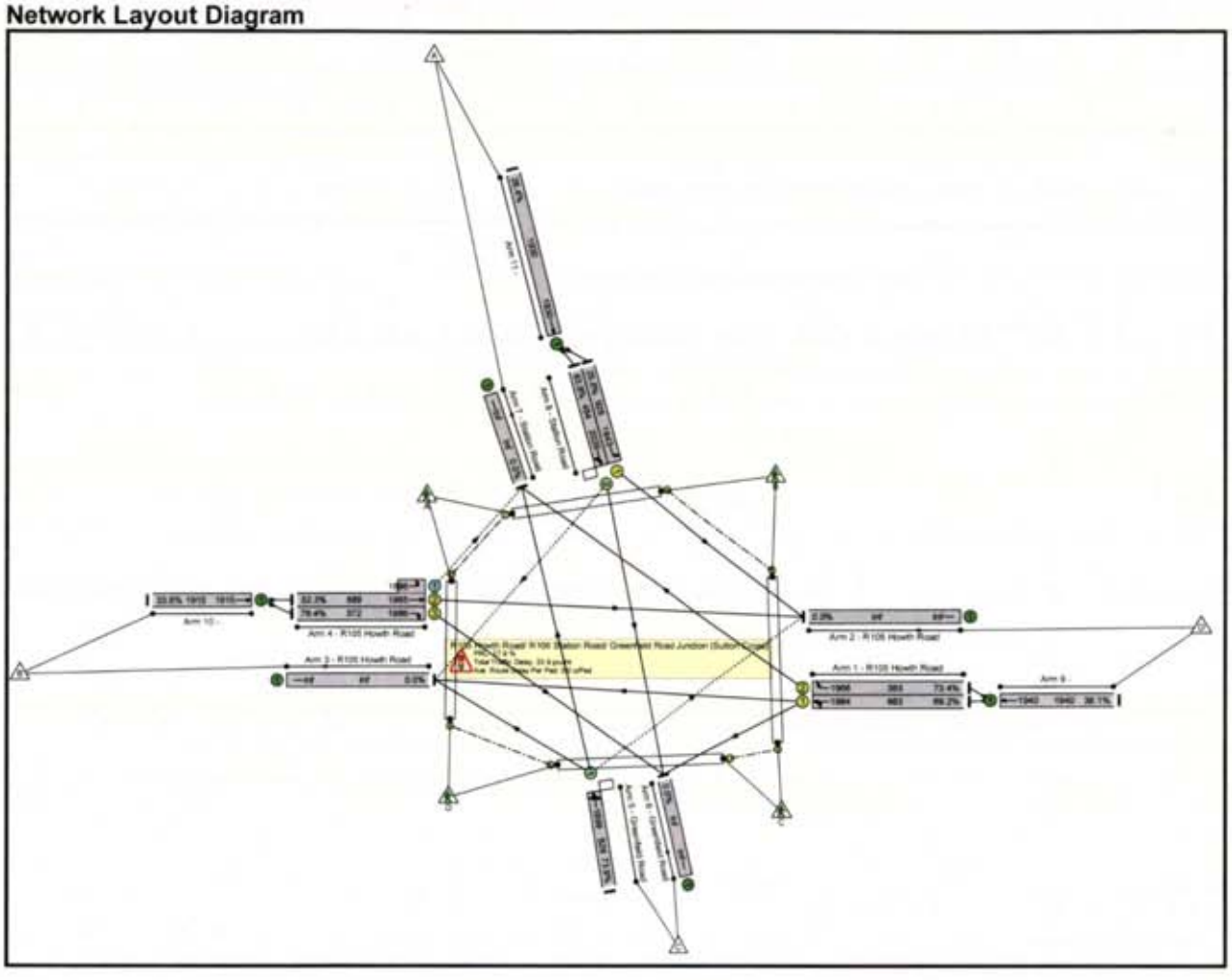
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 19.1 Total Delay for Signalled Lanes (pcuHr): 25.96 Cycle Time (s): 273
PRC Over All Lanes (%): 19.1 Total Delay Over All Lanes(pcuHr): 26.57

Basic Results Summary

Scenario 11: 'Do Minimum (YoO+5) : 2030 AM' (FG11: 'Do Minimum (YoO+5): 2030 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**76.4%**	**34**	**20**	**0**	**33.9**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**76.4%**	**34**	**20**	**0**	**33.9**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	459	1884	663	69.2%	-	-	-	5.9	46.3	17.4
1/2	R105 Howth Road Right	U	E		2	50	-	281	1966	383	73.4%	-	-	-	5.3	68.2	12.0
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	360	1965:1896	689	52.3%	5	20	0	3.9	39.4	12.1
4/3	R105 Howth Road Right	U	B		2	48	-	284	1986	372	76.4%	-	-	-	5.7	71.8	12.6
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	389	1899	526	73.9%	5	0	0	6.2	57.3	15.9
8/1	Station Road Left	U	D		2	132	-	239	1843	925	25.8%	-	-	-	1.5	22.1	6.0
8/2	Station Road Right Ahead	O	C		2	70	-	309	2029	484	63.9%	24	0	0	4.6	53.9	11.9
9/1	Ahead	U	-		-	-	-	740	1940	1940	38.1%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	644	1915	1915	33.6%	-	-	-	0.3	1.4	0.3
11/1	Ahead	U	-		-	-	-	548	1930	1930	28.4%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

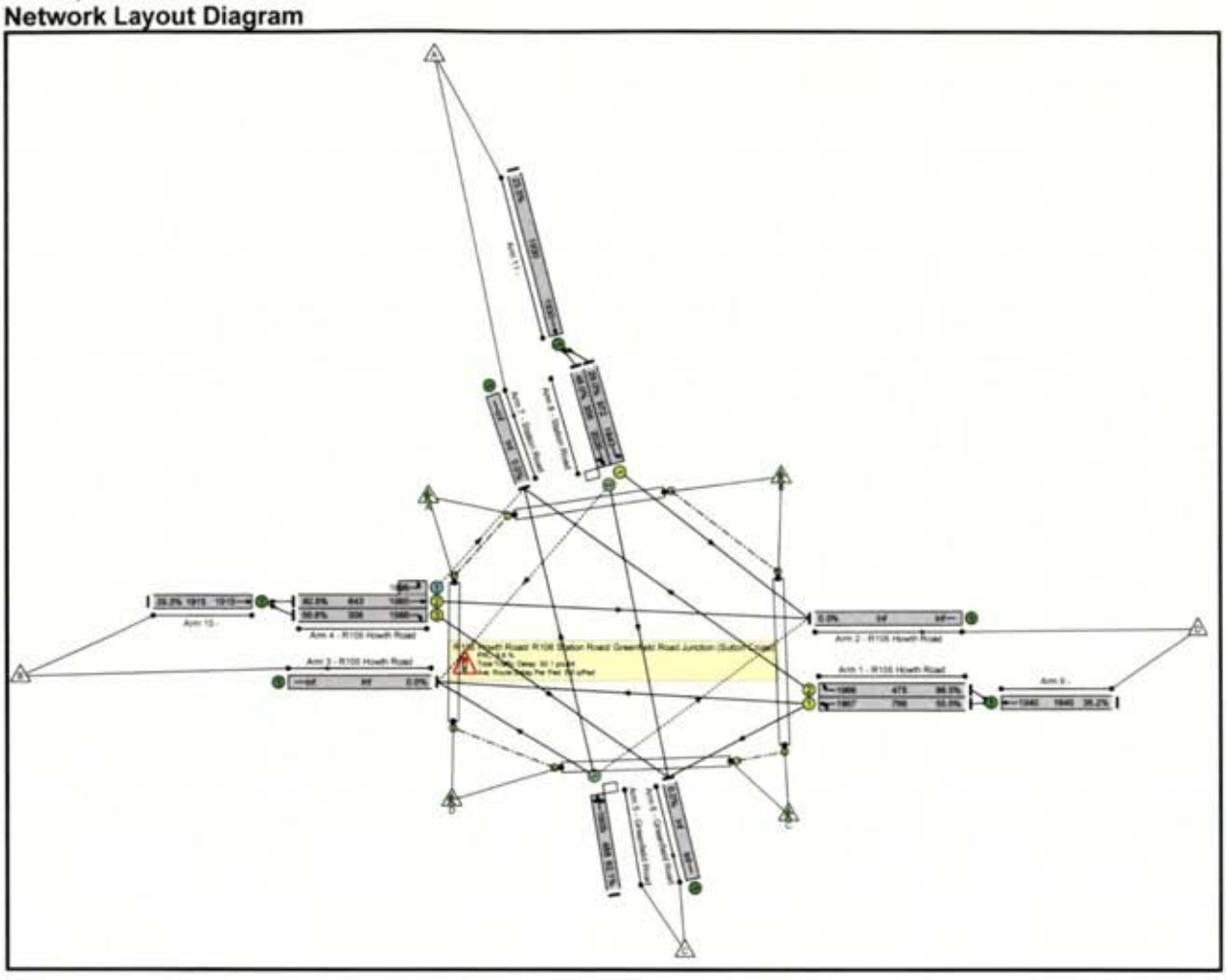
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 17.9 Total Delay for Signalled Lanes (pcuHr): 33.13 Cycle Time (s): 267
PRC Over All Lanes (%): 17.9 Total Delay Over All Lanes(pcuHr): 33.89

Basic Results Summary

Scenario 12: 'Do Minimum (YoO+5) : 2030 PM' (FG12: 'Do Minimum (YoO+5): 2030 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**82.1%**	**24**	**15**	**0**	**30.1**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**82.1%**	**24**	**15**	**0**	**30.1**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	426	1867	766	55.6%	-	-	-	4.3	36.6	14.5
1/2	R105 Howth Road Right	U	E		2	64	-	316	1966	475	66.5%	-	-	-	5.1	58.4	12.8
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	389	1965:1896	643	60.5%	3	15	0	4.9	45.5	14.3
4/3	R105 Howth Road Right	U	B		2	40	-	173	1986	306	56.6%	-	-	-	3.2	67.5	7.3
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	401	1905	488	82.1%	5	0	0	7.6	67.9	17.9
8/1	Station Road Left	U	D		2	142	-	282	1843	972	29.0%	-	-	-	1.7	21.1	7.1
8/2	Station Road Right Ahead	O	C		2	66	-	171	2026	356	48.0%	16	0	0	2.6	54.1	6.3
9/1	Ahead	U	-		-	-	-	742	1940	1940	38.2%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	562	1915	1915	29.3%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	453	1930	1930	23.5%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

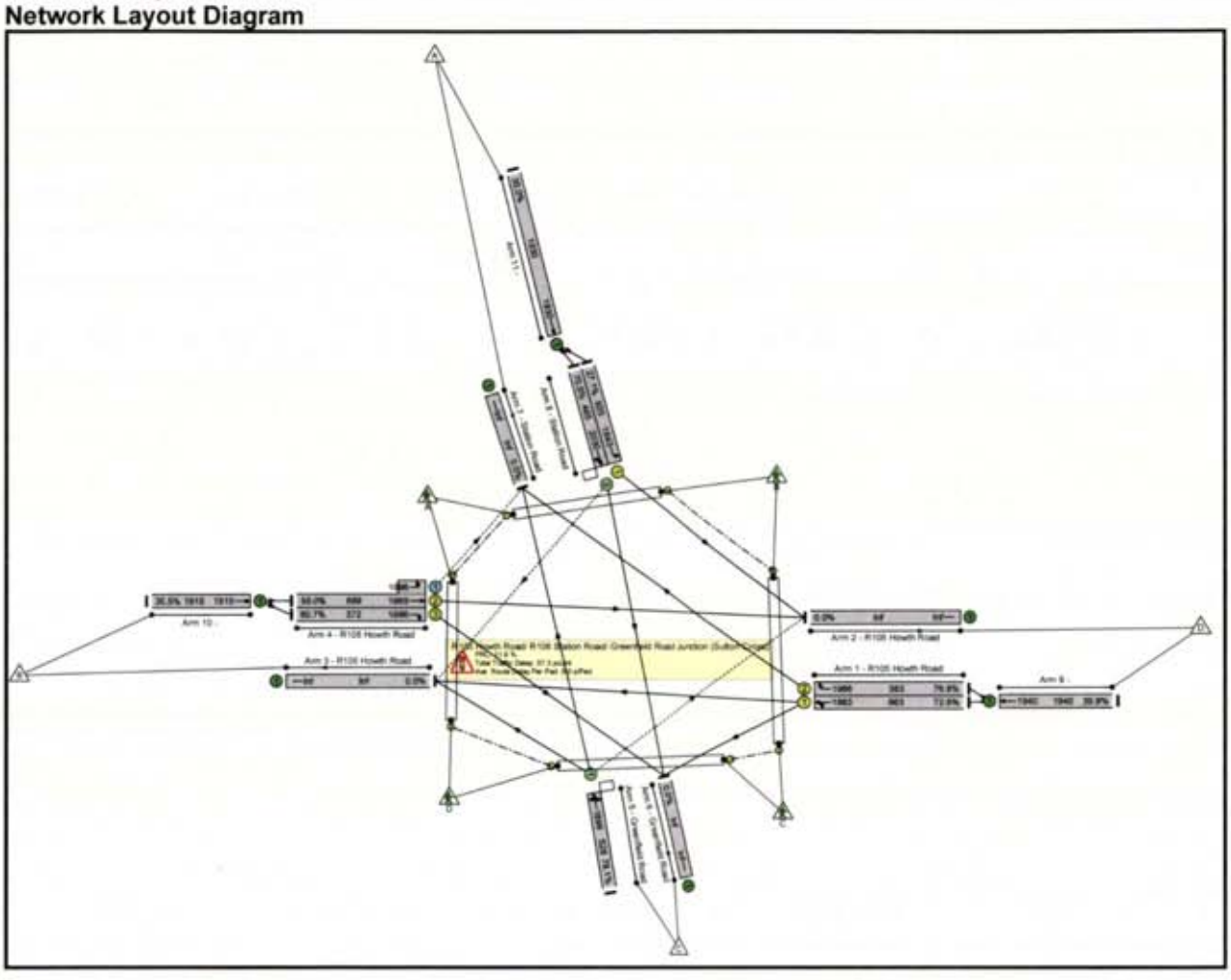
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 9.6 Total Delay for Signalled Lanes (pcuHr): 29.40 Cycle Time (s): 273
PRC Over All Lanes (%): 9.6 Total Delay Over All Lanes(pcuHr): 30.07

Basic Results Summary

Scenario 13: 'Do Minimum (YoO+15) : 2040 AM' (FG13: 'Do Minimum (YoO+15): 2040 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**37.3**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**37.3**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	481	1883	663	72.6%	-	-	-	6.4	47.9	18.7
1/2	R105 Howth Road Right	U	E		2	50	-	294	1966	383	76.8%	-	-	-	5.8	70.9	12.9
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	379	1965:1896	689	55.0%	5	22	0	4.2	40.2	13.1
4/3	R105 Howth Road Right	U	B		2	48	-	300	1986	372	80.7%	-	-	-	6.4	76.3	13.7
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	411	1899	526	78.1%	5	0	0	6.9	60.3	17.3
8/1	Station Road Left	U	D		2	132	-	251	1843	925	27.1%	-	-	-	1.6	22.3	6.4
8/2	Station Road Right Ahead	O	C		2	70	-	328	2030	465	70.5%	25	0	0	5.2	57.2	12.9
9/1	Ahead	U	-		-	-	-	775	1940	1940	39.9%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	679	1915	1915	35.5%	-	-	-	0.3	1.5	0.3
11/1	Ahead	U	-		-	-	-	579	1930	1930	30.0%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

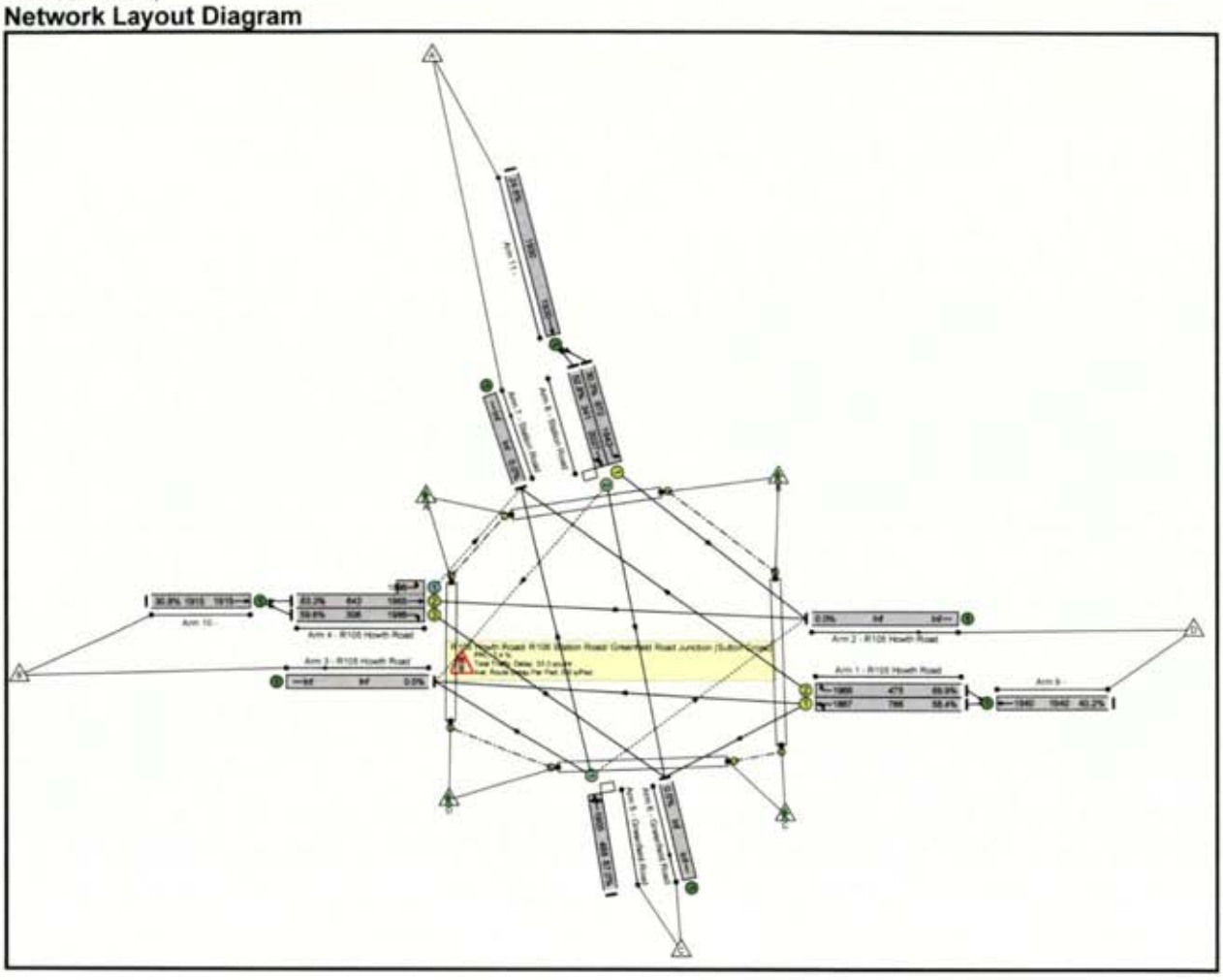
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 11.6 Total Delay for Signalled Lanes (pcuHr): 36.44 Cycle Time (s): 267
PRC Over All Lanes (%): 11.6 Total Delay Over All Lanes(pcuHr): 37.26

Basic Results Summary

Scenario 14: 'Do Minimum (YoO+15) : 2040 PM' (FG14: 'Do Minimum (YoO+15): 2040 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**87.0%**	**24**	**16**	**0**	**33.0**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**87.0%**	**24**	**16**	**0**	**33.0**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	447	1867	766	58.4%	-	-	-	4.6	37.4	15.5
1/2	R105 Howth Road Right	U	E		2	64	-	332	1966	475	69.9%	-	-	-	5.5	60.1	13.8
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	407	1965:1896	643	63.3%	3	16	0	5.3	46.5	15.3
4/3	R105 Howth Road Right	U	B		2	40	-	182	1986	306	59.6%	-	-	-	3.5	68.7	7.8
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	425	1905	488	87.0%	5	0	0	8.9	75.0	20.1
8/1	Station Road Left	U	D		2	142	-	295	1843	972	30.3%	-	-	-	1.7	21.3	7.5
8/2	Station Road Right Ahead	O	C		2	66	-	180	2027	341	52.8%	16	0	0	2.8	55.8	6.8
9/1	Ahead	U	-		-	-	-	779	1940	1940	40.2%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	589	1915	1915	30.8%	-	-	-	0.2	1.4	0.2
11/1	Ahead	U	-		-	-	-	475	1930	1930	24.6%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

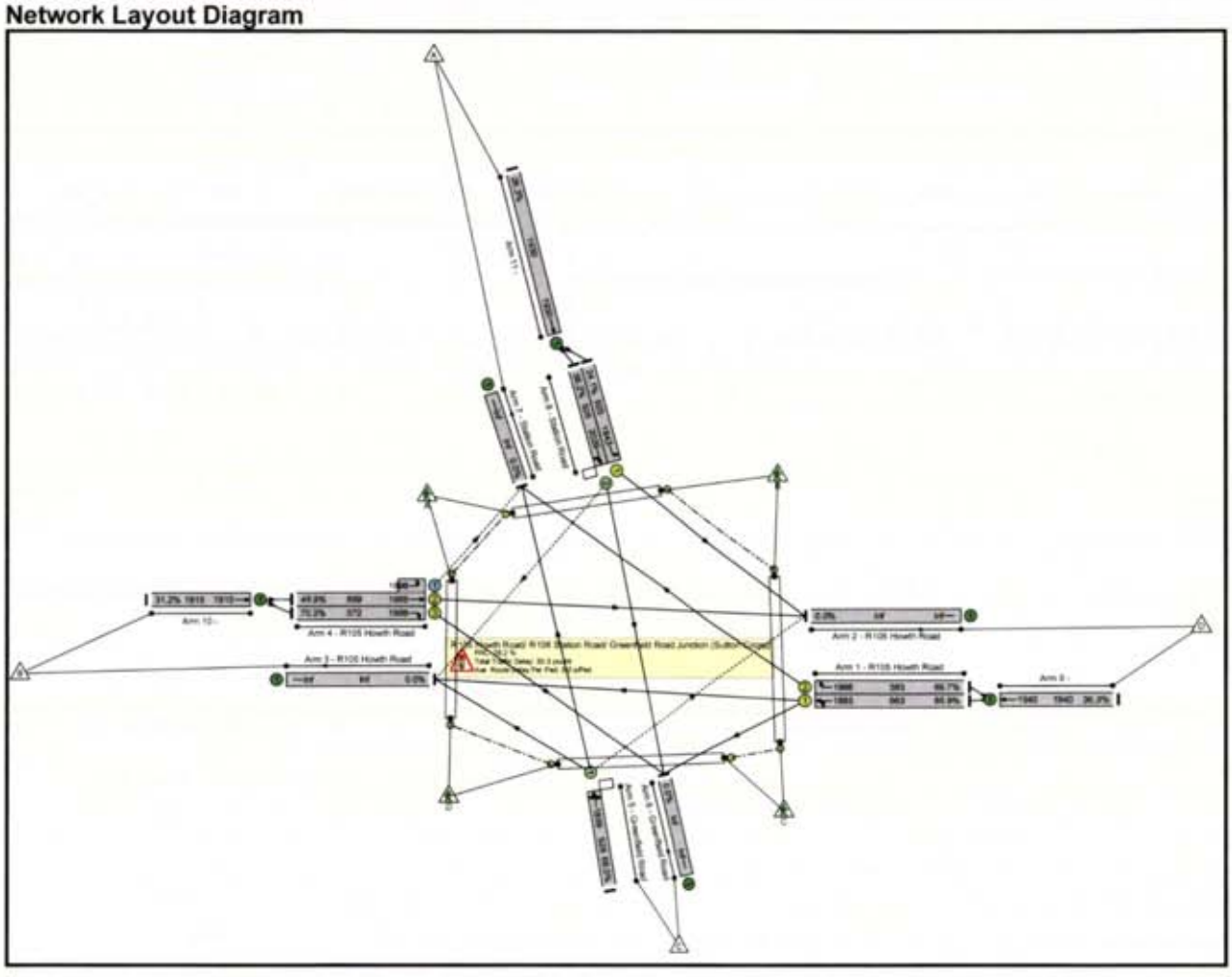
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 3.4 Total Delay for Signalled Lanes (pcuHr): 32.29 Cycle Time (s): 273
PRC Over All Lanes (%): 3.4 Total Delay Over All Lanes(pcuHr): 33.01

Basic Results Summary

Scenario 15: 'Do Something (YoO) : 2025 AM' (FG15: 'Do Something (YoO): 2025 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**19**	**0**	**30.3**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**70.2%**	**31**	**19**	**0**	**30.3**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	437	1883	663	65.9%	-	-	-	5.5	44.9	16.3
1/2	R105 Howth Road Right	U	E		2	50	-	267	1966	383	69.7%	-	-	-	4.9	65.8	11.2
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	337	1965:1896	689	48.9%	4	19	0	3.6	38.6	11.2
4/3	R105 Howth Road Right	U	B		2	48	-	261	1986	372	70.2%	-	-	-	4.9	67.2	11.2
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	358	1899	526	68.0%	5	0	0	5.4	54.1	14.1
8/1	Station Road Left	U	D		2	132	-	223	1843	925	24.1%	-	-	-	1.4	21.9	5.5
8/2	Station Road Right Ahead	O	C		2	70	-	284	2029	505	56.2%	22	0	0	4.0	51.1	10.5
9/1	Ahead	U	-		-	-	-	704	1940	1940	36.3%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	598	1915	1915	31.2%	-	-	-	0.2	1.4	0.2
11/1	Ahead	U	-		-	-	-	507	1930	1930	26.3%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

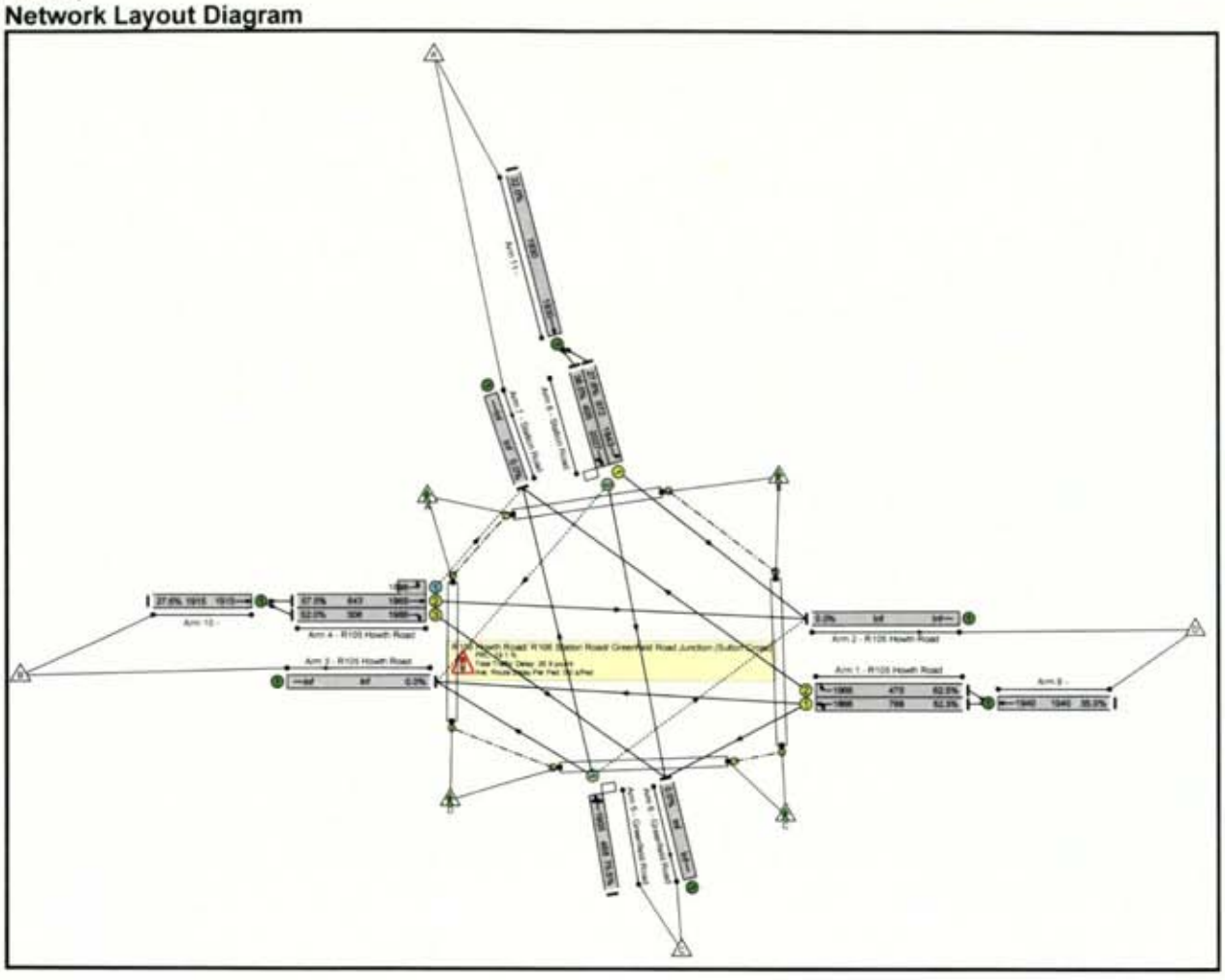
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 28.2 Total Delay for Signalled Lanes (pcuHr): 29.58 Cycle Time (s): 267
PRC Over All Lanes (%): 28.2 Total Delay Over All Lanes(pcuHr): 30.27

Basic Results Summary

Scenario 16: 'Do Something (YoO) : 2025 PM' (FG16: 'Do Something (YoO): 2025 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**75.5%**	**22**	**14**	**0**	**26.9**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**75.5%**	**22**	**14**	**0**	**26.9**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	400	1866	766	52.3%	-	-	-	4.0	35.6	13.3
1/2	R105 Howth Road Right	U	E		2	64	-	297	1966	475	62.5%	-	-	-	4.7	56.7	11.9
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	370	1965:1896	643	57.5%	3	14	0	4.6	44.5	13.4
4/3	R105 Howth Road Right	U	B		2	40	-	159	1986	306	52.0%	-	-	-	2.9	65.8	6.6
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	369	1905	488	75.5%	5	0	0	6.4	62.0	15.7
8/1	Station Road Left	U	D		2	142	-	268	1843	972	27.6%	-	-	-	1.6	20.9	6.7
8/2	Station Road Right Ahead	O	C		2	66	-	156	2027	405	38.5%	14	0	0	2.2	51.0	5.6
9/1	Ahead	U	-		-	-	-	697	1940	1940	35.9%	-	-	-	0.3	1.4	0.3
10/1	Ahead	U	-		-	-	-	529	1915	1915	27.6%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	424	1930	1930	22.0%	-	-	-	0.1	1.2	0.1
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

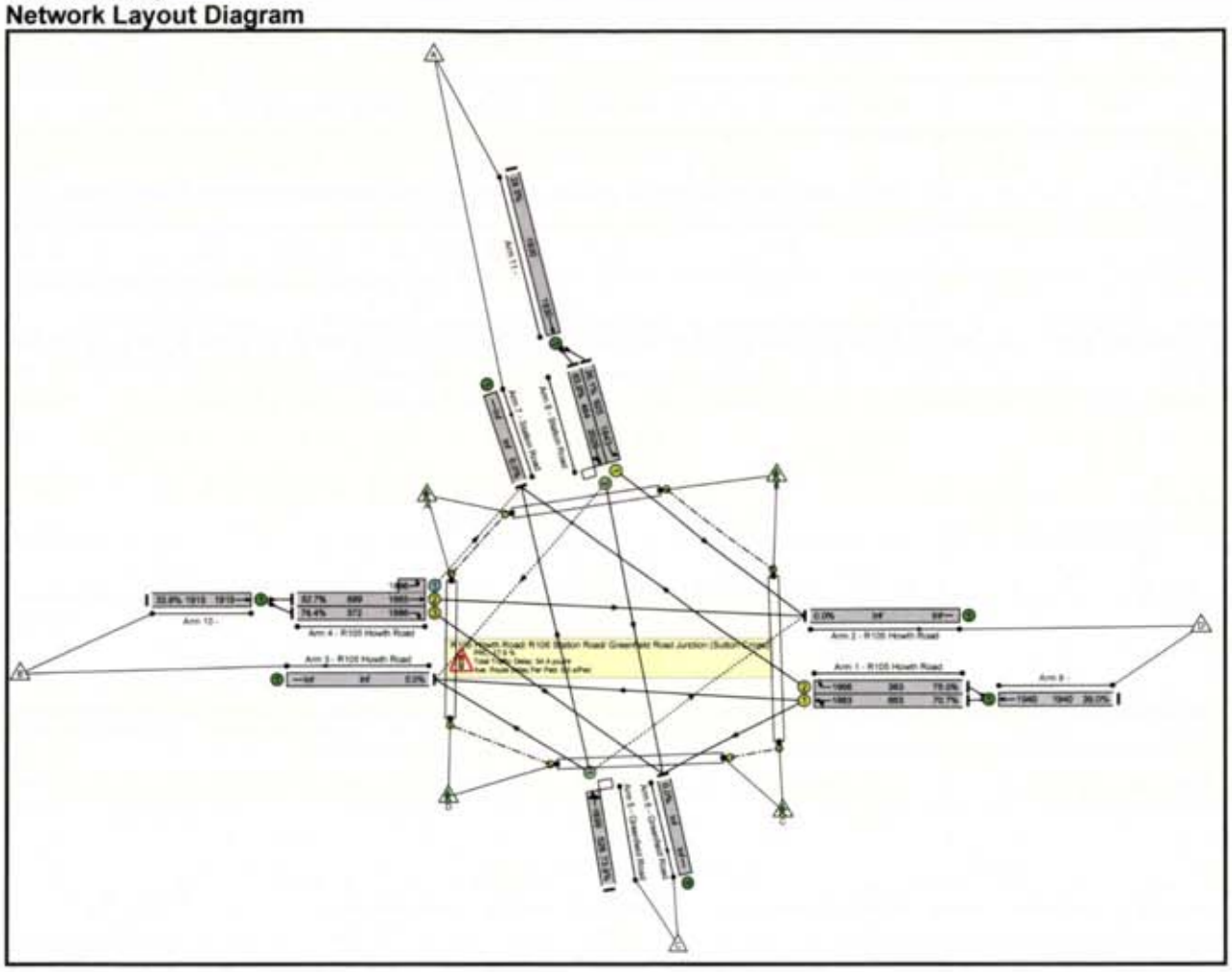
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 19.1 Total Delay for Signalled Lanes (pcuHr): 26.24 Cycle Time (s): 273
PRC Over All Lanes (%): 19.1 Total Delay Over All Lanes(pcuHr): 26.85

Basic Results Summary

Scenario 17: 'Do Something (YoO+5) : 2030 AM' (FG17: 'Do Something (YoO+5): 2030 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**76.4%**	**34**	**20**	**0**	**34.4**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**76.4%**	**34**	**20**	**0**	**34.4**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	469	1883	663	70.7%	-	-	-	6.1	47.0	18.0
1/2	R105 Howth Road Right	U	E		2	50	-	287	1966	383	75.0%	-	-	-	5.5	69.4	12.5
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	363	1965:1896	689	52.7%	5	20	0	4.0	39.6	12.4
4/3	R105 Howth Road Right	U	B		2	48	-	284	1986	372	76.4%	-	-	-	5.7	71.8	12.6
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	389	1899	526	73.9%	5	0	0	6.2	57.3	15.9
8/1	Station Road Left	U	D		2	132	-	241	1843	925	26.1%	-	-	-	1.5	22.2	6.1
8/2	Station Road Right Ahead	O	C		2	70	-	309	2029	484	63.9%	24	0	0	4.6	53.9	11.9
9/1	Ahead	U	-		-	-	-	756	1940	1940	39.0%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	647	1915	1915	33.8%	-	-	-	0.3	1.4	0.3
11/1	Ahead	U	-		-	-	-	550	1930	1930	28.5%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

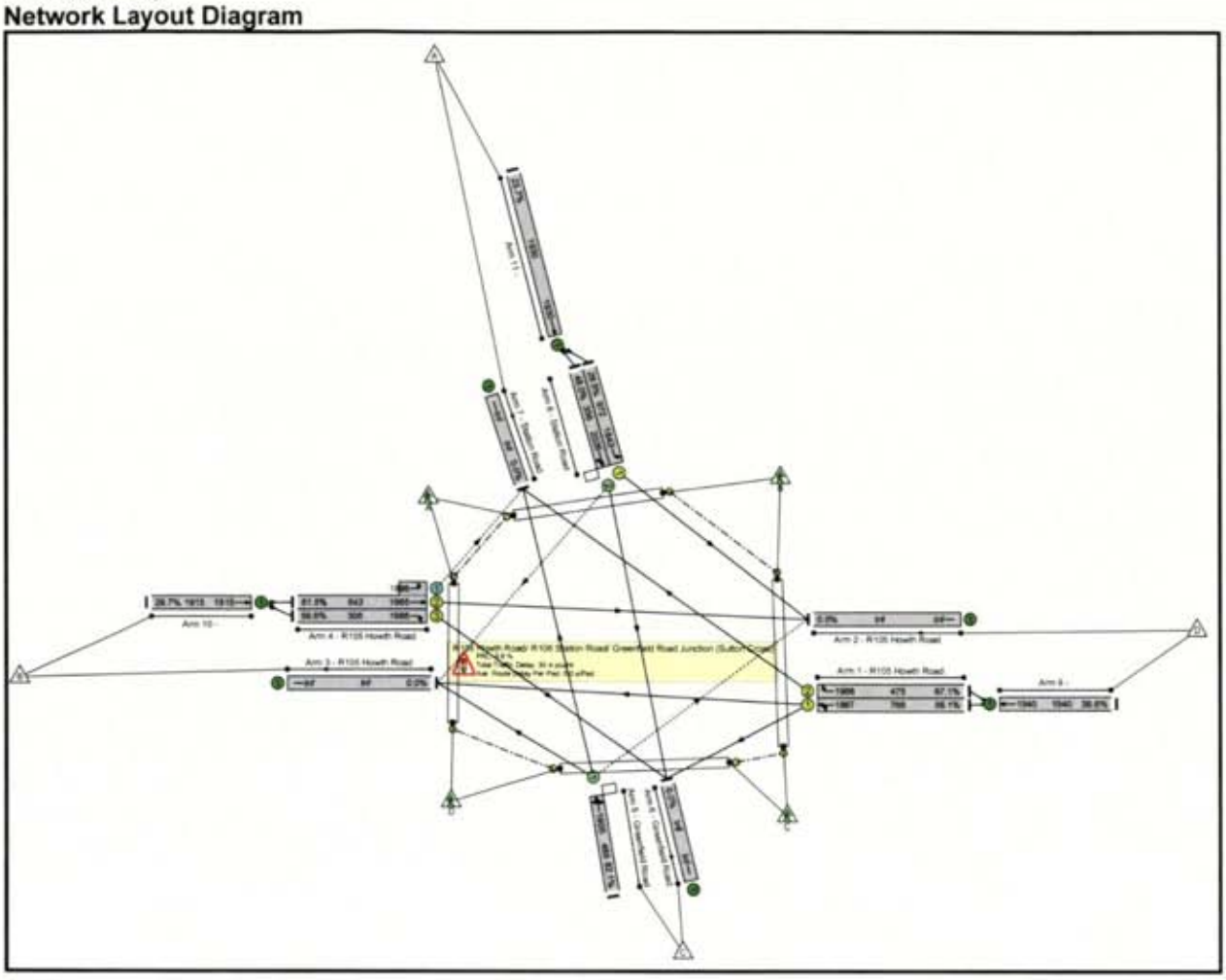
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 17.9 Total Delay for Signalled Lanes (pcuHr): 33.62 Cycle Time (s): 267
PRC Over All Lanes (%): 17.9 Total Delay Over All Lanes(pcuHr): 34.40

Basic Results Summary

Scenario 18: 'Do Something (YoO+5) : 2030 PM' (FG18: 'Do Something (YoO+5): 2030 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**82.1%**	**24**	**15**	**0**	**30.4**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**82.1%**	**24**	**15**	**0**	**30.4**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	430	1867	766	56.1%	-	-	-	4.4	36.7	14.7
1/2	R105 Howth Road Right	U	E		2	64	-	319	1966	475	67.1%	-	-	-	5.2	58.7	13.1
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	396	1965:1896	643	61.5%	3	15	0	5.0	45.9	14.8
4/3	R105 Howth Road Right	U	B		2	40	-	173	1986	306	56.6%	-	-	-	3.2	67.5	7.3
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	401	1905	488	82.1%	5	0	0	7.6	67.9	17.9
8/1	Station Road Left	U	D		2	142	-	287	1843	972	29.5%	-	-	-	1.7	21.2	7.2
8/2	Station Road Right Ahead	O	C		2	66	-	171	2026	356	48.0%	16	0	0	2.6	54.1	6.3
9/1	Ahead	U	-		-	-	-	749	1940	1940	38.6%	-	-	-	0.3	1.5	0.3
10/1	Ahead	U	-		-	-	-	569	1915	1915	29.7%	-	-	-	0.2	1.3	0.2
11/1	Ahead	U	-		-	-	-	458	1930	1930	23.7%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

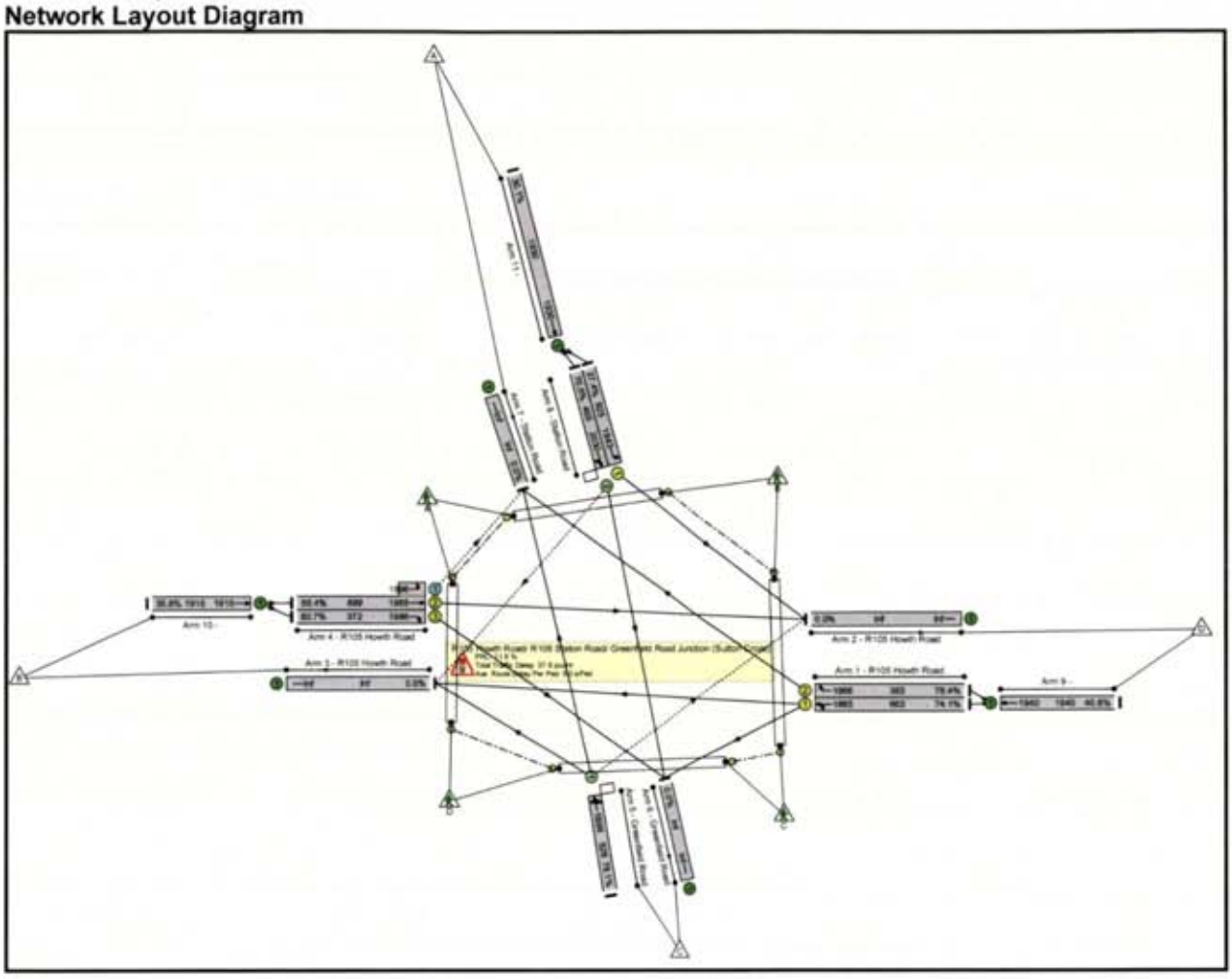
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 9.6 Total Delay for Signalled Lanes (pcuHr): 29.70 Cycle Time (s): 273
PRC Over All Lanes (%): 9.6 Total Delay Over All Lanes(pcuHr): 30.38

Basic Results Summary

Scenario 19: 'Do Something (YoO+15) : 2040 AM' (FG19: 'Do Something (YoO+15): 2040 AM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**37.8**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**80.7%**	**35**	**22**	**0**	**37.8**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	92	-	491	1883	663	74.1%	-	-	-	6.7	48.8	19.3
1/2	R105 Howth Road Right	U	E		2	50	-	300	1966	383	78.4%	-	-	-	6.0	72.4	13.3
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	90	-	382	1965:1896	689	55.4%	5	22	0	4.3	40.3	13.2
4/3	R105 Howth Road Right	U	B		2	48	-	300	1986	372	80.7%	-	-	-	6.4	76.3	13.7
5/1	Greenfield Road Right Left Ahead	O	G		2	72	-	411	1899	526	78.1%	5	0	0	6.9	60.3	17.3
8/1	Station Road Left	U	D		2	132	-	253	1843	925	27.4%	-	-	-	1.6	22.4	6.4
8/2	Station Road Right Ahead	O	C		2	70	-	328	2030	465	70.5%	25	0	0	5.2	57.2	12.9
9/1	Ahead	U	-		-	-	-	791	1940	1940	40.8%	-	-	-	0.3	1.6	0.3
10/1	Ahead	U	-		-	-	-	682	1915	1915	35.6%	-	-	-	0.3	1.5	0.3
11/1	Ahead	U	-		-	-	-	581	1930	1930	30.1%	-	-	-	0.2	1.3	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

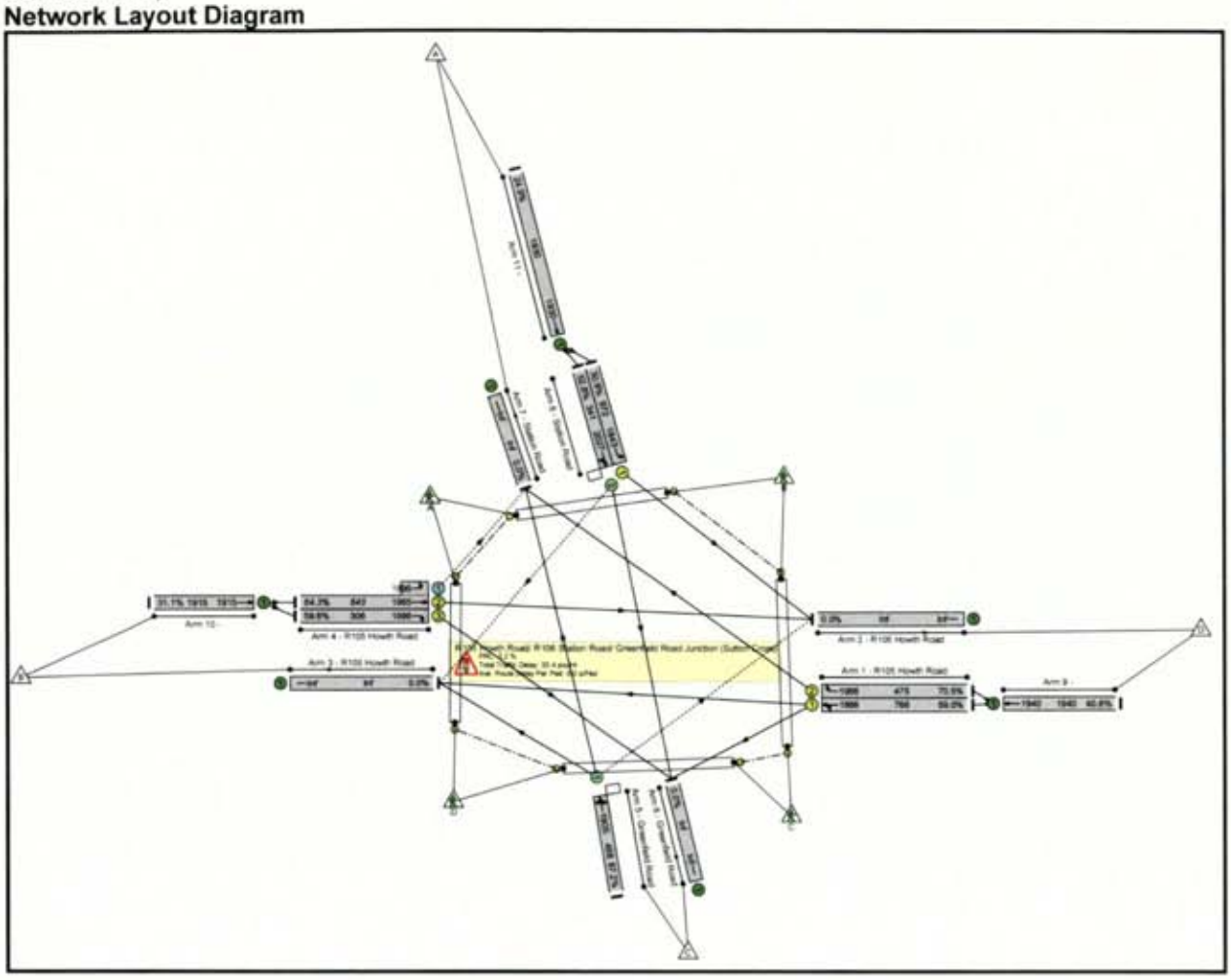
Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1348	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 11.6 Total Delay for Signalled Lanes (pcuHr): 36.99 Cycle Time (s): 267
PRC Over All Lanes (%): 11.6 Total Delay Over All Lanes(pcuHr): 37.82

Basic Results Summary

Scenario 20: 'Do Something (YoO+15) : 2040 PM' (FG20: 'Do Something (YoO+15): 2040 PM', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Layout	-	-	-		-	-	-	-	-	-	**87.2%**	**25**	**16**	**0**	**33.4**	-	-
R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross)	-	-	-		-	-	-	-	-	-	**87.2%**	**25**	**16**	**0**	**33.4**	-	-
1/1	R105 Howth Road Ahead Left	U	F		2	110	-	452	1866	766	59.0%	-	-	-	4.7	37.6	15.8
1/2	R105 Howth Road Right	U	E		2	64	-	335	1966	475	70.5%	-	-	-	5.6	60.4	13.9
4/2+4/1	R105 Howth Road Ahead Left	U+O	A -		2	86	-	414	1965:1896	643	64.3%	3	16	0	5.4	46.9	15.6
4/3	R105 Howth Road Right	U	B		2	40	-	182	1986	306	59.6%	-	-	-	3.5	68.7	7.8
5/1	Greenfield Road Right Left Ahead	O	G		2	68	-	426	1905	488	87.2%	6	0	0	8.9	75.4	20.1
8/1	Station Road Left	U	D		2	142	-	300	1843	972	30.9%	-	-	-	1.8	21.4	7.6
8/2	Station Road Right Ahead	O	C		2	66	-	180	2027	341	52.8%	16	0	0	2.8	55.8	6.8
9/1	Ahead	U	-		-	-	-	787	1940	1940	40.6%	-	-	-	0.3	1.6	0.3
10/1	Ahead	U	-		-	-	-	596	1915	1915	31.1%	-	-	-	0.2	1.4	0.2
11/1	Ahead	U	-		-	-	-	480	1930	1930	24.9%	-	-	-	0.2	1.2	0.2
Ped Link: P1	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P2	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0
Ped Link: P3	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

Basic Results Summary

Ped Link: P4	Unnamed Ped Link	-	H		1	5	-	0	-	1319	0.0%	-	-	-	0.0	0.0	0.0

C1 - R105 Howth Road/ R106 Station Road/ Greenfield Road Junction (Sutton Cross) PRC for Signalled Lanes (%): 3.2 Total Delay for Signalled Lanes (pcuHr): 32.70 Cycle Time (s): 273
PRC Over All Lanes (%): 3.2 Total Delay Over All Lanes(pcuHr): 33.43

APPENDIX 8.1
OPERATIONAL WASTE MANAGEMENT PLAN

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Byrne Environmental
CONSULTING LTD

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OPERATIONAL WASTE MANAGEMENT PLAN

FOR

GLL PRS HOLDCO LTD

RELATING TO A PROPOSED

LARGE RESIDENTIAL DEVELOPMENT

AT

LANDS ADJOINING HOWTH DEMESNE, DEER PARK, HOWTH, CO. DUBLIN

21st May 2024

Ian Byrne MSc, MIOA, Dip Environmental & Planning Law

TABLE OF CONTENTS

1.0 INTRODUCTION

This document presents the Operational Waste Management Plan (OWMP) for the control, management and monitoring of waste associated with a proposed Large scale Residential Development at lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin.

Planning permission is sought for a large-scale residential development on an overall site of approx. 1.5 hectares. The development comprises the delivery of 135 dwellings including 63 no. 1-bedroom units and 72 no. 2-bedroom units across two offset blocks ranging in height from 3-5 storeys. 63 car parking spaces including 4 accessible spaces & 13 EV charging spaces and 6 motorcycle spaces proposed at surface level. A total of 410 bicycle spaces are proposed including the provision of secure bicycle stores. Demolition of 3 sections of the existing demesne northern boundary wall, which fronts Howth Road is proposed to facilitate vehicular and pedestrian access. Undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipes around the site are also proposed.

The **Objective of this Waste Management Plan** is to maximise the quantity of waste recycled by providing sufficient waste recycling infrastructure, waste reduction initiatives and waste collection and waste management information to the residents of the development.

The **Goal of this Waste Management Plan** is to achieve the following waste reduction and recycling targets detailed in the *Waste Management Plan for a Circular Economy 2024-2030.*

Target 1A	Achieve a 6% reduction in residual municipal waste by 2030
Target 2A	Achieve 90% compliance in the dry recycling bin by 2030
Target 2B	Achieve a 10% increase per annum in material compliance in the residual bin by 2030

The OWMP shall be integrated into the design and operation of the development to ensure the following:

- That sufficient waste management infrastructure is included in the design of the development to assist residents minimise the generation of mixed waste streams.
- That the principle of waste segregation at source is the integrated into the development by the provision of 3-bin systems in all residential units
- That all waste materials generated by site activities are removed from site by appropriately permitted waste haulage contractors and that all wastes are disposed of at approved waste licensed / permitted facilities in compliance with the Waste Management Acts 1996-2011 and all associated Waste Management Regulations.

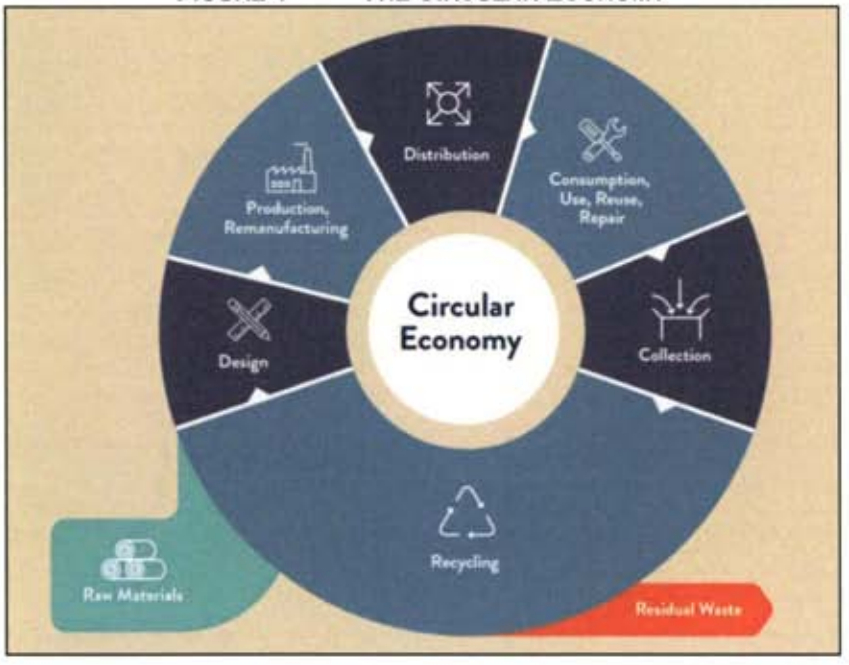
2.0 WASTE MANAGEMENT POLICIES AND GUIDANCE

National Waste Management Plan for a Circular Economy 2024-2030.

This Operational Waste Management Plan has been prepared with regard to the *National Waste Management Plan for a Circular Economy 2024-2030*. This is Ireland's national waste strategy published in March 2024 that replaces the existing regional waste management plans across provincial and local regional authorities and places the emphasis on more waste prevention and increased recycling, reusing and repair practices.

The *Waste Management Plan for a Circular Economy 2024-2030* intends to move Ireland toward a circular economy in which focus is shifted away from waste disposal, favouring circularity and sustainability by identifying and maximising the value of material through improved design, durability, repair and recycling. By extending the time resources are kept within the local economy, both environmental and economic benefits are foreseen.

FIGURE 1 THE CIRCULAR ECONOMY



The Waste Hierarchy

The OWMP complies with the waste hierarchy whereby waste prevention is the most preferred strategy. Where waste generation is unavoidable, re-use is the most preferred fate, followed by recycling and then energy recovery, with disposal (e.g. to landfill) being the least preferred fate.

It is the intention of the Applicant (GLL PRS Holdco Limited) to ensure that the design and operation of the development conforms to the Waste Hierarchy.

FIGURE 2 THE WASTE HIERARCHY

Fingal County Council Development Plan 2023 – 2029

The Operational Waste Management Plan has been prepared in accordance with the relevant waste management objectives of the *Fingal County Council Development Plan 2023 – 2029.*

OBJ IU028 Eastern Midlands Region Waste Management Plan - Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015–2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of that Plan.

OBJ IU034 Waste Management in New Developments - Require the provision of appropriate, well designed, accessible space to support the storage, separation and collection of as many waste and recycling streams as possible in all new commercial and residential developments within the County.

OBJ DMSO235 Communal Refuse Storage Provision - In the case of communal refuse storage provision, the collection point for refuse should be accessible both to the external collector and to the resident and be secured against illegal dumping by non-residents. In the case of individual houses, the applicant shall clearly show within a planning application the proposed location and design of bin storage to serve each dwelling, and having regard to the number of individual bins required to serve each dwelling at the time of the application and any possible future requirements for refuse storage/collection.

OBJ DMSO236 Segregation and Collection of Waste - Ensure all new large-scale residential and mixed-use developments include appropriate facilities for source segregation and collection of waste

OBJ DMSO237 Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened alcoves or other such mitigation measures are provided

OBJ DMSO238 Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres

Fingal Development Plan Development Management Standards – 14.7.12 Refuse Storage in Apartments:

Provision shall be made for the storage and collection of waste in all applications for apartment development. Refuse facilities should be accessible to each apartment stair/lift core and be adequately sized to cater for the projected level of waste generation, types and quantities. Within apartments, there should be adequate provision for the temporary storage of segregated materials prior to removal to communal waste storage. Waste storage areas should not be on the public street and should not be visible to or accessible by the general public. Waste storage areas in basement car parks should be avoided where possible, but where provided, must ensure adequate manoeuvring space for collection vehicles.

The Operational Phase of the Waste Management Plan has also been prepared with regard to *Fingal County Council Storage and Presentation of Household and Commercial Waste Bye-Laws 2020.*

BS 5906:2005 Waste Management in Buildings-Code of Practice

This OWMP has been prepared with regard to *British Standard BS 5906:2005 Waste Management in Buildings-Code of Practice* which provides guidance on methods of storage, collection, segregation for recycling and recovery for residential building.

The Department of Housing, Planning and Local Government – Sustainable Urban Housing: Design Standards for New Apartments

The development will include 3-bin waste segregation systems at source together with the communal waste storage areas have been designed in compliance with *Section's 4.8 and 4.9 Refuse Storage* of *The Department of Housing, Planning and Local Government – Sustainable Urban Housing : Design Standards for New Apartments – Guidelines for Planning Authorities. 2018 (as revised 2022)* as follows:

4.8 Provision shall be made for the storage and collection of waste materials in apartment schemes. Refuse facilities shall be accessible to each apartment stair/lift core and designed with regard to the projected level of waste generation and types and quantities of receptacles required. Within apartments, there should be adequate provision for the temporary storage of segregated materials prior to deposition in communal waste storage and in-sink macerators are discouraged as they place a burden on drainage systems.

4.9 The following general design considerations should be taken into account in the provision of refuse storage facilities:

- *Sufficient communal storage area to satisfy the three-bin system for the collection of mixed dry recyclables, organic waste and residual waste;*

- *In larger apartment schemes, consideration should also be given to the provision of separate collection facilities for other recyclables such as glass and plastics;*

- *Waste storage areas must be adequately ventilated so as to minimise odours and potential nuisance from vermin/flies and taking account the avoidance of nuisance for habitable rooms nearby;*

- *Provision in the layout for sufficient access for waste collectors, proximity of, or ease of access to, waste storage areas from individual apartments, including access by disabled people;*

- *Waste storage areas should not present any safety risks to users and should be well-lit;*

- *Waste storage areas should not be on the public street, and should not be visible to or accessible by the general public. Appropriate visual screening should be provided, particularly in the vicinity of apartment buildings;*

- *Waste storage areas in basement car parks should be avoided where possible, but where provided, must ensure adequate manoeuvring space for collection vehicles;*

- *The capacity for washing down waste storage areas, with wastewater discharging to the sewer.*

3.0 KEY ASPECTS TO ACHIEVE WASTE TARGETS

The OWMP is defined by the following stages of waste management with regard to the Circular Economy and the Waste Hierarchy

Stage 1	Occupier Source Segregation
Stage 2	Occupier Deposit and Storage
Stage 3	Bulk Storage and On-Site Management
Stage 4	Off-Site Removal
Stage 5	End Destination of wastes

The Key Aspects that are designed into the development are:

- 3-Bin systems to encourage waste segregation at source
- Communal Bin Store to provide for Organic, Recyclable, Mixed Waste, Glass and WEEE waste storage
- Residents to be provided with a Bulky Waste collection service

4.0 WASTE SEGREGATION AT SOURCE IN RESIDENTIAL UNITS

The design of all dwellings shall include sufficient internal kitchen space for the segregation at source and storage of general unrecyclable waste, green recyclable waste and organic waste in a 3-bin system.

Image of typical Domestic kitchen 3 bin systems to segregate waste at source

5.0 APARTMENT COMMUNAL WASTE STORAGE AREAS

The apartment blocks shall be served by communal waste storage areas and shall include clearly visible guidelines on the appropriate segregation of different waste types.

Signage to inform residents of their obligations to reduce waste and segregate waste within the home and dispose of waste in the correct bulk bin will be clearly posted within each waste storage area.

The communal waste storage area shall be designed to include the following aspects:

- A defined pedestrian route shall be marked from the apartment buildings to the waste storage area.
- A non-slip surface shall be provided within the waste storage area.
- The waste storage areas shall be passively / mechanically ventilated.
- The waste storage area shall be fitted with sensor lighting.
- The waste storage area shall be fitted with CCTV cameras and associated signage.
- The waste storage area shall be designed to provide safe access from the apartment units by mobility impaired persons.
- The waste storage area shall be no more than 50m from any apartment/duplex unit.
- A dedicated and clearly labelled area shall be provided in which mobility impaired persons may place wastes into receptacles at a lower level which will be subsequently transferred to the bulk storage bins on a weekly basis by the Facilities Management Company.
- The waste storage area shall include ground drainage to sewer to allow for its regular cleaning and disinfection.
- The Facilities Management Company shall engage a mobile bin cleaning service provider to clean waste bins as required.
- The communal waste storage area shall contain a brown organic waste bulk bins. Appropriate signage shall be placed on all brown bins informing residents of the exact nature of organic waste that can be placed in the bin. Signage will also state that all organic waste must be placed within biodegradable bags before placing in the bulk bin.
- The communal waste storage area shall contain a biodegradable waste bag dispenser which will facilitate and encourage residents of apartments and duplexes to separately segregate food and organic waste within their apartments in a dedicated bin.

Image of a typical communal waste storage area

A battery box and a WEEE Bin shall also be provided in the communal waste storage areas, an example of which is shown in the following image. This shall be managed by a specialist waste contractor who will be responsible for its routine collection.

The communal waste storage area shall also contain glass recycling bins. This will allow glass to be diverted away from general waste.

6.0 APARTMENT COMMUNAL WASTE STORAGE AREA DESIGN

The Apartment Blocks shall have communal bin storage areas which shall be of sufficient size to house the required number of 1100 litre bulk bins as detailed in Table 1 below.

The area of a standard 1100 litre bulk bin is 1.7m^2.
The area of a standard 240 litre glass / brown bin is 0.43m^2.

To allow free access to the bins and provide sufficient space for their movement and to provide contingency capacity, the required bin store area = bin floor area x 1.5.

Table 1 Communal Residential Bin Store Minimum Area Requirements

Apartment Block	Minimum Bin Storage Area (m^2) (Area provided)
A & B	44 (50)
C & D	44 (50)

The communal bin stores as designed exceed the minimum area requirement thus contingency space is available.

7.0 AMENITY AREAS WASTE MANAGEMENT

Waste generated in the external amenity areas and spaces shall be managed by the Facilities Management Company who shall ensure there are sufficient 3-bin systems located in each area for easy and clear segregation of waste, an example of which is shown below.

Image of external amenity areas waste segregation recycling bin system

8.0 WASTE MANAGEMENT DUTIES OF THE FACILITY MANAGEMENT COMPANY

Waste Management & Record Keeping

The Facilities Management Company shall maintain a weekly register detailing the quantities and breakdown of general mixed domestic waste, recyclable waste and organic waste wastes removed from the apartment aspect of the development. Supporting documentation shall be provided by the Waste Collection Contractor on a monthly basis. This will allow for waste recycling targets to be tracked to achieve the 50% recycling target and future targets.

The Facilities Management Company shall prepare an annual information report for all apartment residents detailing the quantities and waste types generated by the development for the previous year. The report shall include reminder information on the correct segregation at source procedures and the correct placement of wastes in the waste storage area. Other aspects of ongoing waste management continuous improvement shall also be stated.

Annual Bulky Waste Collections

The Facilities Management Company shall provide a bulky waste collection and transport service to all residents of the development on an annual basis which will allow residents to have bulky items such as appliances and furniture removed from their houses and apartments and transported to a licenced facility. This initiative will also reduce the potential for illegal waste collections and fly-tipping in the local area.

9.0 GENERATED WASTE QUANTITIES

The volume of waste that will be generated during the full occupancy of the development have been calculated with regard to *British Standard BS 5906:2005 Waste Management in Buildings-Code of Practice.*

British Standard BS 5906:2005 Waste Management in Buildings-Code of Practice states that 70 litres of waste are generated per bedroom per week with an allowance of an additional 30 litres per unit per week.

The subject development includes 207 no. bedrooms in 135 no. residential units. The total domestic waste generated per week is detailed in Table 2.

Table 2 Total Weekly Domestic waste generation

Scenario	#	Factor	Weekly Waste litres
Bedrooms	207	70 Litres per week / bedroom	14,490
Units	135	30 litres per week / unit	4,050
Total Weekly Domestic Waste			18,540

10.0 WASTE COLLECTION STRATEGY

All bulk waste bins shall be brought from the communal bin storage areas to the designated bin marshalling areas within the development at road-level by the Facilities Management staff.

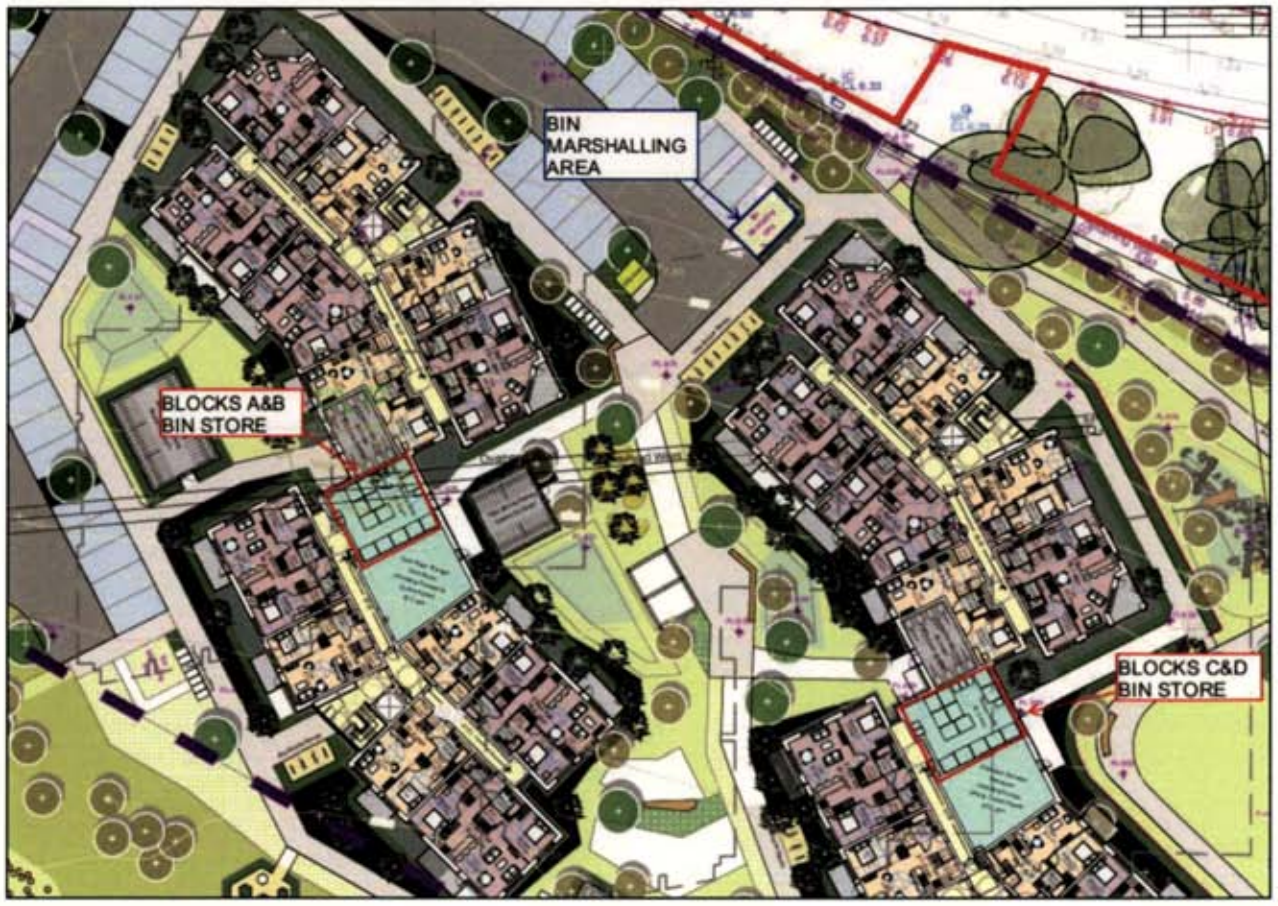
Emptied bins shall be returned to the bin storage areas immediately following collection. Appendix I presents the waste collection vehicle dimensions and turning dimensions.

Table 3 Bin Marshalling Areas Minimum Area Requirements

Block	Minimum Bin Collection Area (m^2)
A & B	20
C & D	20

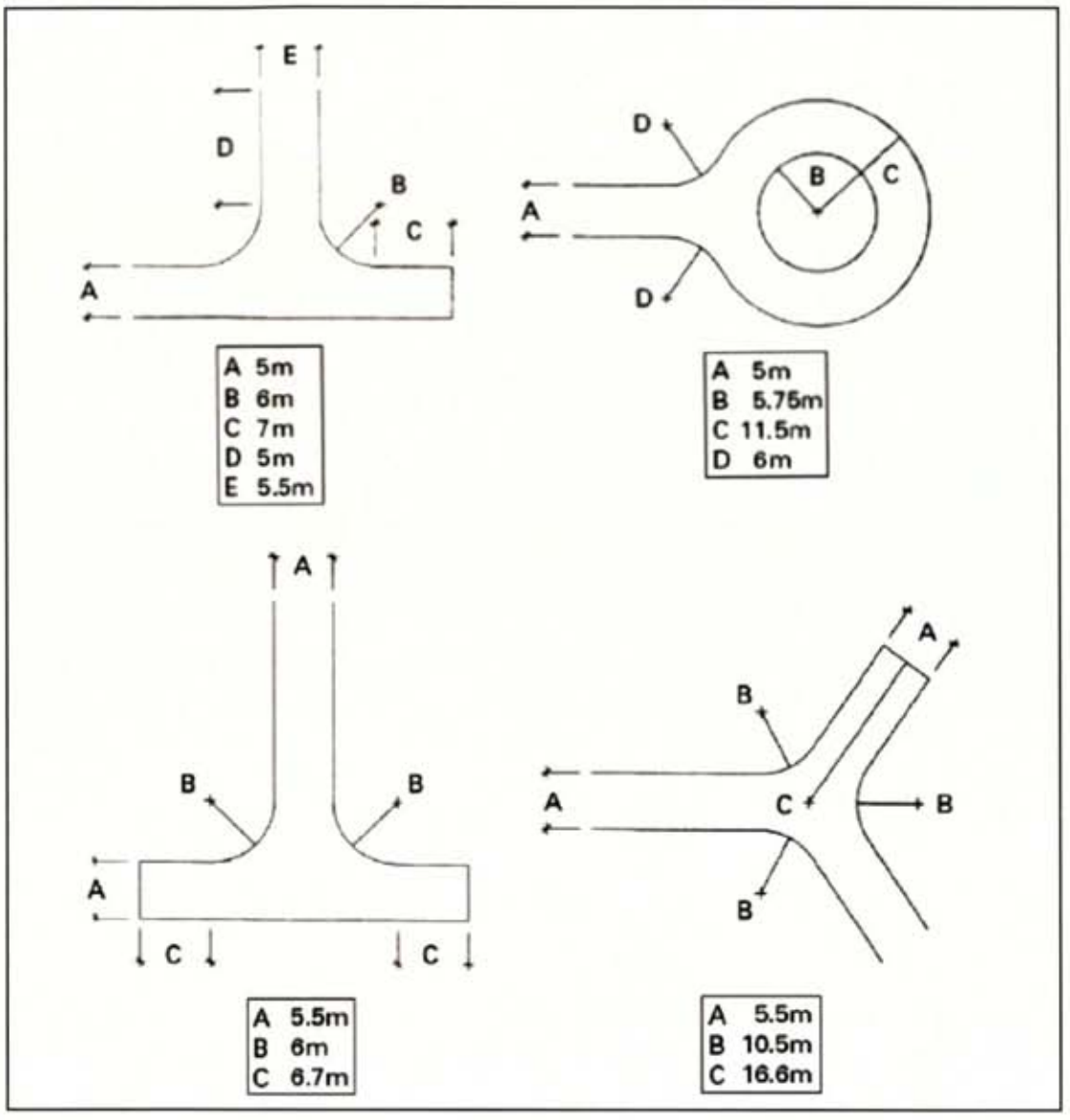
Image of bin transport from bin stores to collection point

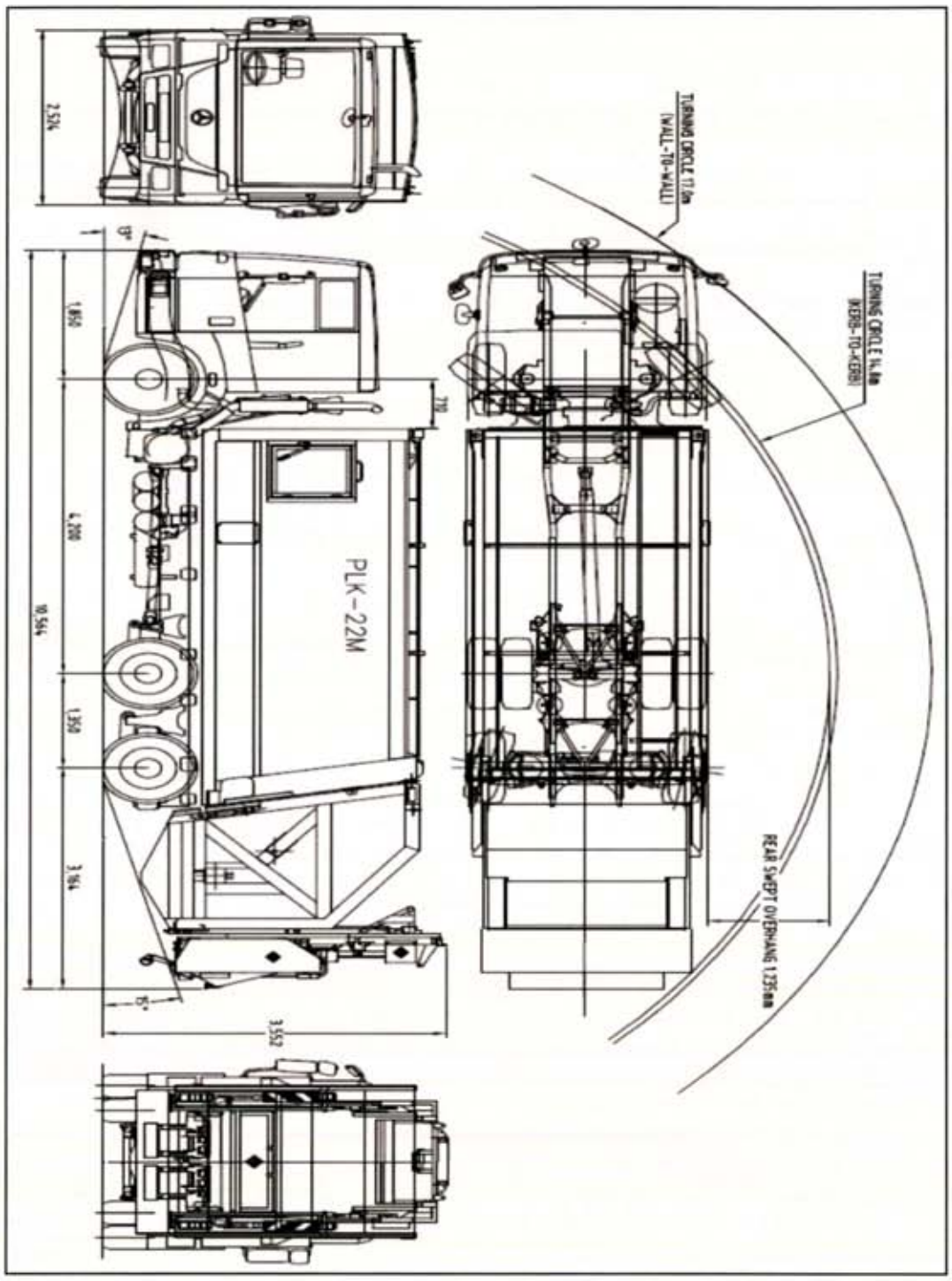
APPENDIX I
Communal Bin Store Locations and Bin Marshalling Area



APPENDIX II

Bin Collection Vehicle dimensions and minimum turning requirements

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APPENDIX 8.2

RESOURCE & WASTE MANAGEMENT PLAN

VOLUME III

APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

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RESOURCE & CONSTRUCTION WASTE MANAGEMENT PLAN

FOR

GLL PRS HOLDCO LTD

RELATING TO A PROPOSED

LARGE RESIDENTIAL DEVELOPMENT

AT

LANDS ADJOINING HOWTH DEMESNE,
DEER PARK, HOWTH,
CO. DUBLIN

21st May 2024

Ian Byrne MSc, MIOA, Dip Environmental & Planning Law

TABLE OF CONTENTS PAGE

1.0 INTRODUCTION

This document presents the Resource and Construction Waste Management Plan (RWMP) for the control, management and monitoring of resources and waste associated with a proposed Large Residential Development at lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin.

Planning permission is sought for a large-scale residential development on an overall site of approx. 1.5 hectares. The development comprises the delivery of 135 dwellings including 63 no. 1-bedroom units and 72 no. 2-bedroom units across two offset blocks ranging in height from 3-5 storeys. 63 car parking spaces including 4 accessible spaces & 13 EV charging spaces and 6 motorcycle spaces proposed at surface level. A total of 410 bicycle spaces are proposed including the provision of secure bicycle stores. Demolition of 3 sections of the existing demesne northern boundary wall, which fronts Howth Road is proposed to facilitate vehicular and pedestrian access. Undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipes around the site are also proposed.

The RWMP has been prepared to demonstrate how the Construction Phase will comply with the following relevant legislation, relevant Best Practice Guidelines and Local Authority Waste Management Policies:

- *Waste Management Acts 1996-2011*
- *Waste Management (Collection Permit) Regulations 2007 – 2023 (as amended)*
- *EPA Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects, April 2021*
- *Fingal Development Plan 2023 – 2029*
- *National Waste Management Plan for a Circular Economy 2024-2030*
- *EPA (2020). A guide to by-products and submitting a notification under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011)(Draft):*
- *EPA (2019). Guidance on Soil and Stone By-Products in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011*

The Key Aspects of this RWMP are:

1 To maximise the use of resources in the Design and Construction Phases and to minimise the generation of waste with regard to the following principals:

- Green Procurement and Design
- Resource Re-Use, Recycling and Management
- Waste Prevention and Segregation

2 To maximise the segregation of construction waste materials on-site to produce uncontaminated waste streams for re-use and recycling both on-site and off-site.

2.0 FINGAL DEVELOPMENT PLAN WASTE OBJECTIVES

The *Fingal Development Plan 2023-2029* includes specific Objectives relating to the management of Construction and Demolition Waste as follows:

OBJ DMSO241 Construction and Demolition Waste Management Plan. Require that Construction and Demolition Waste Management Plans be submitted as part of any planning application for projects in excess of any of the following thresholds:

- *New residential development of 10 units or more.*
- *New developments other than above, including institutional, educational, health and other public facilities, with an aggregate floor area in excess of 1,250 sqm.*
- *Demolition / renovation / refurbishment projects generating in excess of 100m^3 in volume of C&D waste.*
- *Civil engineering projects in excess of 500m^3 of waste materials used for development of works on the site*

OBJ DMSO242 Guidance for Construction and Demolition Waste Management Plans. Require that Construction and Demolition Waste Management Plans include the following:

- Hours of operation.
- Construction/phasing programme.
- Traffic Management Plan including employee parking and movements.
- Noise, Vibration, Air Quality and Dust Monitoring and Mitigation Measures.
- Details of any construction lighting including appropriate mitigation measures for lighting specifically designed to minimise impacts to biodiversity, including bats.
- The management of construction and demolition waste included as part of a Construction and Demolition Waste Management Plan.
- Containment of all construction-related fuel and oil within specially constructed bunds to ensure that fuel spillages are fully contained (such bunds shall be roofed to exclude rainwater).
- A water and sediment management plan, providing for means to ensure that surface water runoff is controlled such that no silt or other pollutants enter local water courses or drains

3.0 THE CIRCULAR ECONOMY

This Resource and Waste Management Plan has been prepared with regard to the *National Waste Management Plan for a Circular Economy 2024-2030.* This is Ireland's national waste strategy published in March 2024 that will replace the existing regional waste management plans across provincial and local regional authorities and places the emphasis on more waste prevention and increased recycling, reusing and repair practices.

The *Waste Management Plan for a Circular Economy 2024-2030* intends to move Ireland toward a circular economy in which focus is shifted away from waste disposal, favouring circularity and sustainability by identifying and maximising the value of material through improved design, durability, repair and recycling. By extending the time resources are kept within the local economy, both environmental and economic benefits are foreseen.

The *National Management Plan for a Circular Economy 2024-2030 has the following construction waste target*

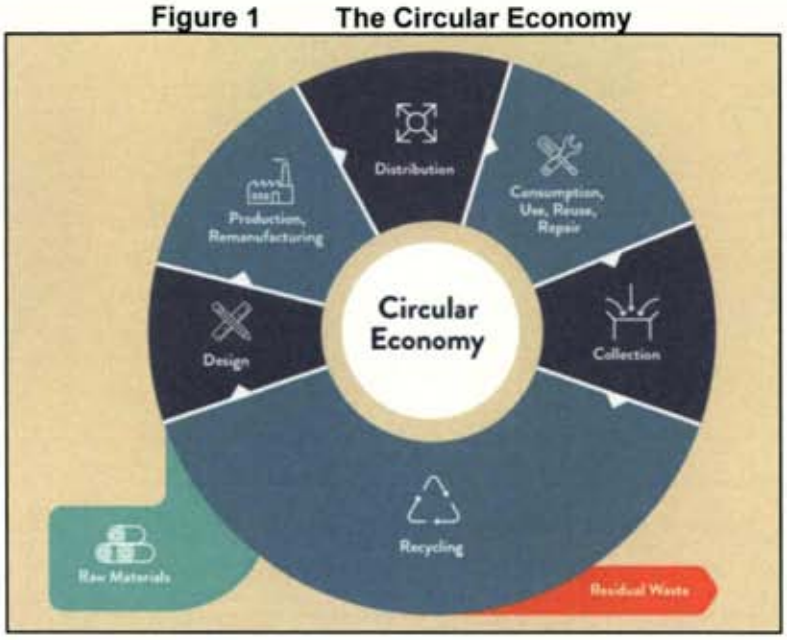
Target 1B Reduce Construction and Demolition Waste by 12% by 2030

The *Waste Framework Directive* has set a recycling target of 70% of non-hazardous Construction & Demolition Waste

The proposed development will implement the above policy as follows:

- Re-Use on-site of excavated soils and stones as fill material and as landscaping material.
- The purchase of construction materials as needed to prevent over supply and potential for damage whilst in storage.
- The segregation of construction waste streams into separate storage containers to maximise the potential for the re-use of the materials.
- The import of Article 27 soils where possible.
- The Developer of the Project is committed to implementing the relevant aspects of the Circular Economy Policy throughout the construction phase of the development.

Figure 1 The Circular Economy



It is the Applicants (GLL PRS Holdco Limited) Policy to conform to the waste hierarchy (Figure 2), whereby waste prevention is the most preferred strategy. Where waste generation is unavoidable, re-use is the most preferred fate, followed by recycling and then energy recovery, with disposal (e.g. to landfill) being the least preferred fate.

Figure 2 The Waste Hierarchy

4.0 PROJECT DESCRIPTION

4.1 Proposed Development

The proposed development relates to a site of c.1.10ha fronting onto Howth Road which will include 140 residential units and associated amenity space and car-parking.

Figure 3 Site Plan

4.2 Site History

The proposed application area is greenfield and is enclosed along its northern and eastern boundaries by a demesne wall. A review of historical aerial photography identifies that other than partial use as a racetrack, which use ceased in 1842, the site has been in its present condition i.e. greenfield.

4.3 Existing Structures

There are no structures on the site.

4.4 Site Clearance

To facilitate the development the site shall be stripped of soils and vegetation. Soils for re-use on site will be maintained in stockpiles.

4.5 Material Balance Cut and Fill

Approximately 10.000m^3 (c.16,000 tonnes) of soils may be exported of site for disposal at a suitably licenced facility. A conversion figure of 1.6 to convert m^3 to tonnes has been applied to determine the tonnage of soils in Table 4 below.

4.6 Export Soil Analysis

Soils to be exported from the site at the site have been classified as non-hazardous in the *Ground Investigations Ireland* Waste Classification Report January 2020 in accordance with the *EPA (2018) Waste Classification Guidance – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* by utilising the results of laboratory analysis and the *Haz Waste Online Classification Tool.* Soils have been classified as Category A as summarised in Table 1 below. Appendix I includes a summary of the *HazWasteOnLine* report.

Table 1 Individual sample waste category

Sample ID	Sample Depth (m)	Material Type	Waste Category	LoW Code
TP-01	0.00-1.00	Clay	A	17 05 04
TP-02	0.00-1.00	Clay	A	17 05 04
TP-02	1.00-2.00	Clay	A	17 05 04
TP-02	2.00-3.00	Clay	A	17 05 04
TP-03	0.00-1.00	Clay	A	17 05 04
TP-03	1.00-2.00	Clay	A	17 05 04
TP-04	0.00-1.00	Clay	A	17 05 04
TP-05	1.00-2.00	Clay	A	17 05 04
TP-05	2.00-3.00	Clay	A	17 05 04
TP-05	3.00-3.50	Clay	A	17 05 04
TP-06	0.00-1.00	Clay	A	17 05 04
TP-06	1.00-2.00	Clay	A	17 05 04
TP-06	2.00-3.10	Clay	A	17 05 04
TP-07	1.00-2.00	Clay	A	17 05 04
TP-07	2.00-3.00	Clay	A	17 05 04

Sample ID	Sample Depth (m)	Material Type	Waste Category	LoW Code
TP-07	3.00-3.30	Clay	A	17 05 04
TP-08	0.00-1.00	Clay	A	17 05 04
TP-08	1.00-2.00	Clay	A	17 05 04
TP-09	1.00-2.00	Clay	A	17 05 04
TP-09	2.00-3.00	Clay	A	17 05 04
TP-09	3.00-3.30	Clay	A	17 05 04
TP-10	1.00-2.00	Clay	A	17 05 04
TP-10	2.00-3.00	Clay	A	17 05 04
TP-10	3.00-3.20	Clay	A	17 05 04
TP-11	1.00-2.00	Clay	A	17 05 04
TP-11	2.00-3.00	Clay	A	17 05 04
TP-11	3.00-3.40	Clay	A	17 05 04
TP-12	0.00-1.00	Clay	A	17 05 04
TP-12	1.00-2.00	Clay	A	17 05 04
TP-12	2.00-3.00	Clay	A	17 05 04

4.7 Invasive Species

Species listed on the *Third Schedule of S.I. 477/2011 (as amended)*

A survey for invasive species was undertaken in September 2023 by the ecologists, *Enviroguide Consulting*. No invasive species were identified at the subject site.

4.8 Asbestos

There are no structures on site that could contain asbestos containing materials (ACM). Asbestos was not detected in any of the soil samples taken.

4.9 Hours of Operation

Construction Working Hours are as follows:
Monday to Friday 08:00hrs – 18:00hrs
Saturday 08:00hrs – 13:00hrs
No works will occur on Sundays or Bank Holidays or after hours

4.10 Project Phasing

The general sequence of development works is detailed below in Table 2.

Table 2 Sequence of Construction Works

Activity Sequence	General Description
Site access and security	Set up site access point and erect site hoarding
Identification of Existing Utility Services	Set up bunting, mark location of live services, including E.S.B., Gas etc.
Removal of Vegetation	e.g. Trees and vegetation
Demolition	3 sections of existing northern boundary wall
Site Preparation	Soil stripping, stockpiling, export
Compounds	Establish materials storage compound and waste management compound
Facilities	Install site offices and welfare units
Infrastructure installation	Drainage, Utility ducts, power, internal roads
Substructure	Foundations
Superstructure	Frames
External Envelope	Place façade to superstructure
Internal Finishes	Mechanical & Electrical
External Landscaping	Hard and soft landscaping, road surfacing

4.11 Traffic Management Plan

A Site-Specific Construction Traffic Management Plan (CTMP) will be prepared by the Contractor for agreement by Fingal County Council.

4.12 Noise, Vibration, Air Quality and Dust Monitoring & Mitigation Measures

A Site-Specific Construction Environmental Management Plan (CEMP) detailing noise, vibration and dust monitoring and mitigation and control measures will be prepared by the Contractor for agreement by Fingal County Council.

4.13 Water and sediment Management Plan

- All water leaving the site during construction will be desilted using standard techniques including silt buster/silt socks.
- During the enabling works all surface water from site will be discharged to wastewater sewer following desilting in agreement with Fingal County Council and Uisce Éireann.
- Desilting and petrochemical interception of all surface runoff/pumped water will take place for the length of the construction project.
- A petrochemical interceptor will be placed on the surface water network prior to discharge
- Local silt traps shall be established throughout site.
- Mitigation measures shall include dust control, stockpiling away from watercourses and drains,
- Stockpiling of loose materials will be a minimum of 20m from existing and proposed drains.
- Stockpiles and runoff areas following clearance will have suitable silt barriers to prevent runoff of fines into the drainage system.
- Fuel, oil and chemical storage will be sited within a bunded area. The bund will be at least50m away from drains, excavations and other locations where it may cause pollution.
- Bunds will be kept clean and spills within the bund area will be cleaned immediately to prevent groundwater contamination. Any water-filled excavations, including the attenuation tank during construction, that require pumping will not directly discharge to the surface water network. Prior to discharge of water from excavations adequate filtration and petrochemical interception will be provided to ensure no deterioration of water quality and ensure compliance with the Water Pollution Acts.
- Site layout during excavation works will be designed to ensure vehicles do not enter the works area unless necessary for the excavation and soil removal processes. All machinery leaving the works area will be thoroughly cleaned before being allowed on to public roads.
- A road sweeper (including vacuum) will be in place (as required) to unsure cleanliness of nearby and haul roads (where necessary), particularly during enabling works.

4.14 Site Lighting

Site lighting will be provided with the minimum luminosity sufficient for safety and security purposes to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas

Motion sensor lighting and low energy consumption fittings will be installed to reduce usage and energy consumption

Site lighting positioned and directed so as not to unnecessarily intrude on adjacent buildings and land uses, ecological receptors and to avoid causing distraction or confusion to passing motorists.

Tower crane mounted 1000W metal halide floodlights will be cowled and angled to minimise spillage to surrounding properties

5.0 RWMP Roles and Responsibilities

5.1 Project Director / Manager

The Project Director will be responsible for the overall implementation of the RWMP and providing the budget for its implementation and management. The Project Director will ensure that the reporting and recording requirements are met and all necessary resources are in place to support the implementation of the RWMP from Design Stage to Project Completion.

5.2 Resource and Waste Manager

The Resource and Waste Manager (RWM) will be responsible for:

- Implementing all aspects of the RWMP throughout the Construction Phase.
- Assisting the Project Manager on the implementing of the aspects of the Circular Economy.
- Ensuring that all resources are managed throughout the Construction Phase
- Recording the volumes and types of construction wastes generated.
- Communicating with the Local Authority on waste related matters and issuing of waste records.
- Management of the waste storage compound to ensure that all construction waste streams are stored separately and that cross-contamination does not occur.
- Maintaining a file of all Waste Collection Permits and Waste Facility Permits / Waste Licences that each waste load is exported to.
- Ensuring that all waste loads exiting the site are contained in a vehicle displaying an appropriate NWCPO Permit number.
- Maintaining a receipt of each waste load delivered to authorised facilities.
- Identifying and reporting on damaged construction materials and identifying how damage to resources and materials shall be prevented.
- Preparation of monthly waste management report detailing waste volumes generated, re-use and recycling rates and details on damaged raw materials and how they can be returned for repair and future re-use.
- Conducting Resource and Waste Management Audits
- Communicating with the EPA regarding Article 27 By-Product determinations

- The name and contact details of the Resource and Waste Manager and Key Project Staff shall be included in Table 2 pending grant of permission.

5.3 Site Personnel

All personnel on site will be responsible for the effective implementation of the RWMP. All staff will receive Induction and Tool-Box training on resource management and waste prevention, segregation and disposal.

5.4 Gate Person

Gate Person duties will include the inspection all vehicles exiting site with waste to ensure that they have a Waste Collection Permit (WCP) Number displayed on the side of the vehicle.

If the vehicle does not have a WCP Number displayed, the vehicle will be refused exit and the RWM will ensure that the waste load is returned to the site area from where it came.

5.5 Staff Training

Copies of the RWMP will be made available to all relevant personnel on site. The RWM will arrange for all site personnel and contractors to be instructed about / receive training on the objectives of the RWMP and materials management, and be informed of the responsibilities that fall upon them as a consequence of its implementation The topics to be covered will include;

- Project programme and requirements
- Health and Safety requirements
- RWMP
- Materials to be segregated
- Segregation systems and protocols
- Arrangement for the storage and handling of reusable materials and recyclables
- Document control requirements

Where source segregation and materials re-use techniques apply, each member of staff will be given instructions on how to comply with the RWMP and will be displayed for the benefit of site staff.

Table 3 Principal Project Staff

Title	Name	Contact Details
Project Director	Barney O'Reilly	TBC
Construction Director	Mike Galvin	TBC
Construction Manager	TBC	TBC
Resource & Waste Manager	TBC	TBC
Site Engineer	TBC	TBC

6.0 Resource and Construction Waste Management Design Approach

This section provides details on how resource optimisation and the management and minimisation of waste streams shall be implemented from design phase through to completion of the project.

6.1 Site Preparation

- Reuse site fencing and staff welfare units from previous Projects.
- Minimise concrete use in site compounds.

6.2 Re-Use of existing site elements

- Identify materials that can be re-used or recycled on-site to minimise the use of virgin materials.
- Top and sub-soils may be retained on-site and re-used for landscaping purposes
- Stone from the northern boundary wall to be demolished may be retained and re-used in its restoration.

6.3 The Use of Recycled materials and surplus materials

- Use recycled aggregates where possible to minimise the use of virgin materials.
- Identify materials which have a % of recycled material contained within them e.g., Asphalt may include recycled glass or recycled asphalt.
- Where material surpluses arise, they shall be stored to prevent damage and re-used on other projects or returned to the supplier.

6.4 Materials Procurement

- Identify suppliers that can supply low environmental impact products and materials
- Identify recycled materials to be used on the project
- Minimise over-ordering to reduce over storage and to minimise potential of damage to materials
- Request that material suppliers take back damaged materials for repair and re-use.
- Request that suppliers minimise packaging on all materials

6.5 Off-Site Construction

The use of pre-constructed building elements is an efficient process that minimises the generation of on-site construction waste.

- Wood / Steel frames and wall facade panels shall be constructed off-site and assembled on-site.
- Balconies shall be constructed off-site
- Pre formed façade panels

6.6 Soil Management

Planning the Optimal Site Level
The Applicant undertakes surveys of the levels of sites to determine the most appropriate ground level for the development. In doing so we reduce the requirement for either excavating material or bringing additional soil to site to bring the site to the designed finished floor levels. This intervention at the design stage directly impacts our carbon footprint by reducing the number of heavy goods vehicle journeys to and from site carrying soil.

Circular Economy: Targeting Net Zero Soil Import
Once on site, wherever possible, the required level is achieved by transferring soil within the site rather than importing and exporting soil. This process, known as "cut and fill" is used on all our sites. This approach gives the ability to work towards net zero soil import and export. Where this is not possible, we leverage our total landbank using our excess soil for fill on other sites, with the end goal of sending as little soil to landfill as possible.

7.0 Description of Waste Arisings

The expected construction waste that will be generated throughout the course of the development is detailed in Table 4 below.

The calculated construction waste tonnage has been derived from the *Building Research Establishment Environmental Assessment Method (BREEAM)* which specifies that 11.1 tonnes of construction waste is generated for every 100m^2 of development area. Based on the combined building area contained in the Schedule of Accommodation for the development of c.11,704m^2, it has been calculated that up to c. 1299 tonnes of construction waste may be produced.

The tonnage of soils and stones to be generated has been determined from the cut and fill analysis for the site.

Table 4 details the EPA's % breakdown of Construction waste for 2022. Table 5 details the predicted construction waste volumes to be generated.

Table 4 Construction Waste Composition EPA 2020 Waste Statistics

Waste Type	% composition of total waste
Metal	15
Wood Plastic Glass	4
Bituminous Materials	10
Concrete Brick Gypsum	41
Mixed C&D	30

Table 5 Predicted construction waste

LoW Code	Description	Volume Generated (tonnes)	Prevention (tonnes) Non Waste	Reused (tonnes) Non-Waste	Recycled (tonnes) Waste	Recovered (tonnes) Waste	Disposed (tonnes) Waste
17 01 01	Concrete Brick Tiles and Ceramics	533	0	288	218	0	27
17 01 02							
17 01 03							
17 02 01	Wood Glass Plastic	52	0	0	41	10	1
17 02 02							
17 02 03							
17 03 02	Bituminous Material	130	0	56	74	0	0
17 04 07	Mixed Metals	195	0	0	195	0	0
17 05 04	Soil and Stone	16,000	0	16,000	0	0	16,000
17 09 04	Mixed C&D Waste	390	0	510	608	296	230
20 01 08	Biodegradable Canteen Waste	10	0	0	0	0	10
20 03 01B	Mixed Municipal Waste	10	0	0	0	0	10
20 01 01	Paper & Cardboard	1	0	0	1	0	0

8.0 CONSTRUCTION WASTE MANAGEMENT

- From the outset of construction activities, a dedicated and secure compound containing bins, and/or skips, and storage areas, into which all waste materials generated by construction site activities, will be established within the active construction phase of the development site.

- Spill kits shall be located within the site compound with clearly labelled instructions on how they shall be used to clean up fuel/oil spills.

- All vehicle and plant oils and liquid construction materials shall be stored in secure impermeable storage units.

- All diesel-powered generators shall be inspected on at least a weekly basis by a delegate of the project manager to ensure it is not leaking diesel or oils.

- All empty containers containing residual quantities of oils, greases and hydrocarbon-based liquids shall be stored in a dedicated, clearly labelled impermeable container.

- In order to ensure that the construction contractor correctly segregate waste materials, it is the responsibility of the site construction manager to ensure all staff are informed by means of clear signage and verbal instruction and made responsible for ensuring site housekeeping and the proper segregation of construction waste materials.

- It will be the responsibility of the Resource and Waste Manager (RWM) to ensure that a written record of all quantities and natures of wastes exported off-site are maintained on-site in a Waste File at the Project office.

- It is the responsibility of the RWM that all contracted waste haulage drivers hold an appropriate Waste Collection Permit for the transport of waste loads and that all waste materials are delivered to an appropriately licenced or permitted waste facility in compliance with the following relevant Regulations:

    - *Waste Management Act 1996-2011*
    - *Waste Management (Collection Permit) Regulations 2007-2023 (as amended)*
    - *Waste Management (Facility Permit and Registration) Regulations 2007-2023 (as amended)*

- Prior to the commencement of the Project, the RWM shall identify a permitted Waste Contractor(s) who shall be engaged to collect and dispose of all inert and hazardous wastes arising from the project works.

- The RWM shall maintain copies of all Waste Collection Permits and copies of the Waste Facility Permit or Waste Licence to which waste materials are exported to. The RWM shall ensure that all Permits/Licences are within date.
- All waste soils prior to being exported off-site, shall be classified as inert, non-hazardous or hazardous in accordance with the *EPA (2018) Waste Classification Guidance – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* document to ensure that the waste material is transferred by an appropriately

permitted waste collection permit holder and brought to an appropriately permitted or licensed waste facility.

Figure 4 Construction Waste segregation compound design concept

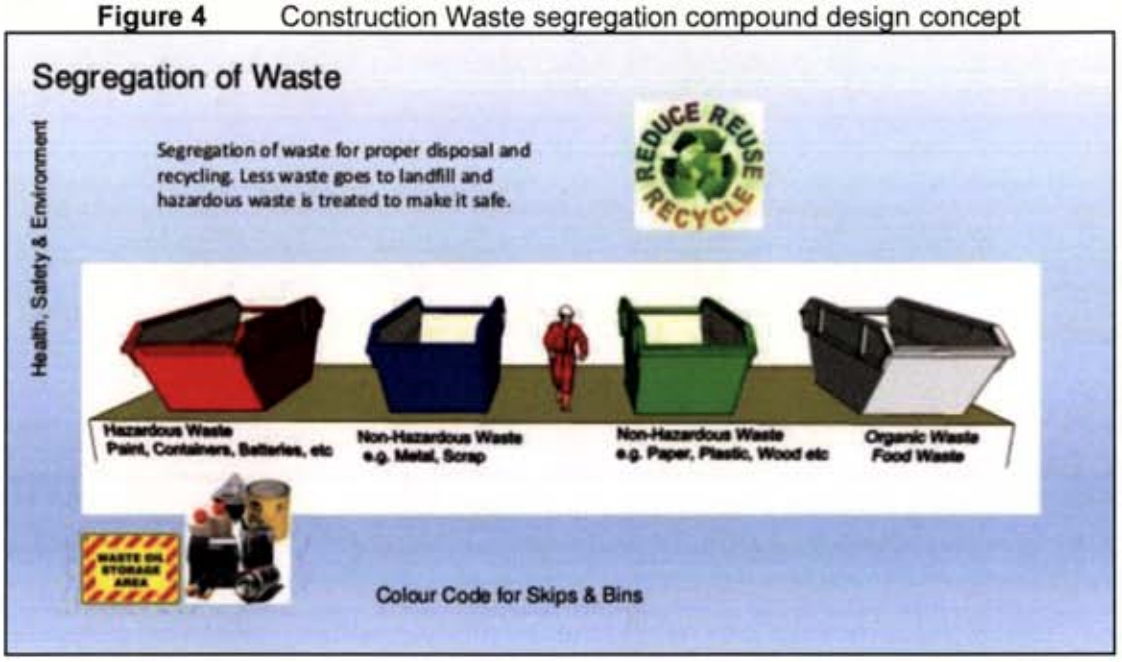


Figure 5 Oil Spill Kit

Figure 6 Bund for waste oil container storage

9.0 On-Site Resource Management & Waste Reuse Recycling and Management

This section of the RWMP describes how construction waste shall be minimised and how the re-use and recycling of wastes shall be maximised

- Materials shall be ordered on an *"as needed"* basis to prevent over supply and preventing damage to bulk orders stored on-site.
- Materials shall be stored and handled in a manner that minimises the generation of damaged materials
- Materials shall be ordered in appropriate sequence to minimise materials stored on site
- All staff and Sub contractors shall be advised through inductions and tool box talks on how to dispose of their waste correctly on-site.
- Broken concrete blocks and excess aggregate materials shall be segregated and stored off-site for use as hard standing material on future projects. This will result in the following positive impacts:
    - Reduction in the requirement for virgin aggregate materials from quarries
    - Reduction in energy required to extract, process and transport virgin aggregates
    - Reduced HGV movements associated with the delivery of imported aggregates to the site
    - Reduction in the amount of landfill space required to accept C&D waste
- Excess wood will be segregated in separate skips and sent for recycling.
- Plastic arising from general waste or packaging will be segregated and stored in separate skips.
- Metals waste shall be stored in dedicated skips
- Top soil that is stripped shall be retained in managed bunds to prevent erosion and reduce the leaching of minerals from the soil.

10.0 WASTE SOILS & STONES EXPORT & ARTICLE 27 DECLARATIONS

Excavated excess soils that are required to be exported off-site have been tested to and are non-hazardous in accordance with EPA (2018) *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous.* Non-Hazardous soils may be suitable for re-use in other construction sites and may be declared as a by-product in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 2011*. Article 27 requires that the material classified not a waste but a by-product must meet specific criteria and that a declaration of a material as a by-product is notified to the EPA. The EPA publication *A guide to by-products and submitting a notification under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011)* shall be considered in this regard. Appendix I presents the schematic process by which a material is determined as a waste or a by-product.

The records of all Article 27 declarations and WAC Analytical Tests and *Haz Waste Online* assessments shall be maintained on-site by the RWM.

11.0 WASTE RECORD KEEPING

It is the responsibility of the RWM that a record of all quantities and natures of all wastes reused / recycled and exported off-site during the project are maintained in a Waste File at the Project office.

The following information shall be recorded for each load of waste exported off-site:

- Waste Type EWC Code and description.
- Volume of waste collected.
- Waste collection contractor's Waste Collection Permit Number and collection receipt including vehicle registration number.
- Destination of waste load including Waste Permit / Licence number of facility.
- Description of how waste at facility shall be treated i.e. disposal / recovery / export

An indicative template is contained in Figure 7, to ensure that full traceability of materials to its final destination.

Verifiable and validated tracking and authorisation documentation will be maintained for all wastes destined for re-use, recovery, recycling or disposal. Justification will also be provided where a disposal option had been employed.

The waste records shall be maintained on-site and made available to Fingal County Council as requested.

12.0 RESOURCE AND WASTE MANAGEMENT AUDITING

The effectiveness of a Resource and Waste Management Plan and its implementation, will be subject to quarterly audits by the RWM throughout the duration of the construction phase.

Audits will focus on materials inputs to the project and the waste outputs identifying:

Resources
How resource management was integrated into the design of project buildings and areas

Re-use, recycling of existing on-site materials prior to development including soils, buildings, structures.

Re-using surplus materials from previous development projects eg office cabins, fencing, aggregates, concrete products.

Additional opportunities for future resource management.

Waste
The audits will also investigate the operational factors and management policies that contribute to the generation of waste and identify appropriate corrective actions, where necessary.

Performance targets will be developed, e.g. an 85% overall recycling target, successes and failures will be recorded and Action Plans will be developed to address any issue which arise.

Inspections of the waste storage areas will be undertaken and recorded on a weekly basis, issues relating to housekeeping, inappropriate storage and segregation of wastes.

The RWM will record the findings of the audits, including types and quantities of waste arising, final treatments and costs, in a quarterly audit report.

The Final Waste Audit will examine the manner of how resources are managed and how and where the waste is produced and how waste generation can be reduced in future projects.

13.0 WASTE EXPORT PERMITS/LICENCES

All vehicles exiting the site containing any waste material shall be inspected by the gate man to ensure that they display on the side of the vehicle a NWCPO (National Waste Collection Permit Office) issued Waste Collection Permit Number.

Where a NWCPO issued Waste Collection Permit Number is not displayed the RWM shall be notified and the vehicle shall be instructed to return the waste load to the specific area on the site and will not be allowed exit the site with the waste load.
Table 6 shall be updated once a main contractor has been appointed.

Table 6a Register of Waste Collection Permits

Holder	Address & Contact	Waste Collection Permit #	Expiry Date	Materials Accepted
TBC				

TBC To be Confirmed

Table 6b Register of Local Authority issued Waste Facility Permits

Holder	Facility Address & Contact	Waste Collection Permit #	Expiry Date	Materials Accepted
TBC				

TBC To be Confirmed

Table 6c Register of EPA issued Waste Licences

Holder	Facility Address & Contact	Waste Licence #	Expiry Date	Materials Accepted
TBC				

TBC To be Confirmed

Figure 7 Example of Waste Tracking Template

Waste Source	Waste Type	LoW Code	Haulier	Acceptance Facility Permit #	Tonnage	Date	Vehicle Reg NWCPO#
Site 1	Inert Soil & Stone	17 05 04	Murphy	Huntstown Quarry Wfpfg09000601	20	10.10.21	22D1234 NWCPO-ABC123
Site 1	Metals	17 04 07	O' Reilly	Hammond Lane P1002-01	10	11.10.21	22D5678 NWCPO-123ABC
Site 1	Concrete	17 01 01	Smyth	IMS Hollywood W0129-02	30	12.10.21	22D1234 NWCPO-ABC123

Appendix I
Summary *Hazwasteonline* report

HazWasteOnline™

Waste Classification Report

M6FS4-PP6BN-ZTST2

Job name

Howth Road 19-21002

Description/Comments

Project

9298-12-19

Site

Howth Road

Related Documents

#	Name	Description
1	Howth Road 19-21002.HWOL	.hwol file used to create the Job

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name:
Barry Sexton
Date:
02 Jan 2020 15:57 GMT
Telephone:
00353876119640

Company:
Ground Investigations Ireland
Catherinestown House,
Hazelhatch Road, Newcastle
Co. Dublin

Report

Created by: Barry Sexton
Created date: 02 Jan 2020 15:57 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	TP-01-17/12/2019-0.00-1.00m		Non Hazardous		3
2	TP-02-17/12/2019-0.00-1.00m		Non Hazardous		6
3	TP-02-17/12/2019-1.00-2.00m		Non Hazardous		9
4	TP-02-17/12/2019-2.00-3.00m		Non Hazardous		12
5	TP-03-17/12/2019-0.00-1.00m		Non Hazardous		15
6	TP-03-17/12/2019-1.00-2.00m		Non Hazardous		18
7	TP-04-17/12/2019-0.00-1.00m		Non Hazardous		21
8	TP-05-17/12/2019-1.00-2.00m		Non Hazardous		24
9	TP-05-17/12/2019-2.00-3.00m		Non Hazardous		27
10	TP-05-17/12/2019-3.00-3.50m		Non Hazardous		30
11	TP-06-17/12/2019-0.00-1.00m		Non Hazardous		33
12	TP-06-17/12/2019-1.00-2.00m		Non Hazardous		36

GROUND INVESTIGATIONS IRELAND

HazWasteOnline™
Report created by Barry Seeton on 02 Jan 2020

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
13	TP-06-17/12/2019-2.00-3.10m		Non Hazardous		39
14	TP-07-17/12/2019-1.00-2.00m		Non Hazardous		42
15	TP-07-17/12/2019-2.00-3.00m		Non Hazardous		45
16	TP-07-17/12/2019-3.00-3.30m		Non Hazardous		48
17	TP-08-17/12/2019-0.00-1.00m		Non Hazardous		51
18	TP-08-17/12/2019-1.00-2.00m		Non Hazardous		54
19	TP-09-17/12/2019-1.00-2.00m		Non Hazardous		57
20	TP-09-17/12/2019-2.00-3.00m		Non Hazardous		60
21	TP-09-17/12/2019-3.00-3.30m		Non Hazardous		63
22	TP-10-17/12/2019-1.00-2.00m		Non Hazardous		66
23	TP-10-17/12/2019-2.00-3.00m		Non Hazardous		69
24	TP-10-17/12/2019-3.00-3.20m		Non Hazardous		72
25	TP-11-17/12/2019-1.00-2.00m		Non Hazardous		75
26	TP-11-17/12/2019-2.00-3.00m		Non Hazardous		78
27	TP-11-17/12/2019-3.00-3.40m		Non Hazardous		81
28	TP-12-17/12/2019-0.00-1.00m		Non Hazardous		84
29	TP-12-17/12/2019-1.00-2.00m		Non Hazardous		87
30	TP-12-17/12/2019-2.00-3.00m		Non Hazardous		90

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APPENDIX 9.1
IMPACT RATINGS AND ASSESSMENT CRITERIA

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 9.1 - Impact Ratings and Assessment Criteria

Table 1 Glossary of Impacts following EPA Guidance Documents (Draft 2017 Guidelines)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

APPENDIX 9.2

NRA CRITERIA FOR RATING THE MAGNITUDE AND SIGNIFICANCE OF IMPACTS AT EIA STAGE NATIONAL ROADS AUTHORITY (NRA, 2009)

VOLUME III

APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 9.2 - NRA Criteria for Rating the Magnitude and Significance of Impacts at EIA Stage National Roads Authority (NRA, 2009)

Table 1 Criteria for Rating Site Attributes – Estimation of Importance of Soil and Geology Attributes (NRA)

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying route is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes. Geological feature of high value on a local scale (County Geological Site). Well drained and/or high fertility soils. Moderately sized existing quarry or pit. Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying route is moderate on a local scale	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying route is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

Table 2 Criteria for Rating Site Attributes – Estimation of Importance of Hydrogeological Attributes (NRA)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Table 3 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Soil/ Geology Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves. Irreversible loss of high proportion of local high fertility soils. Removal of entirety of geological heritage feature. Requirement to excavate/remediate entire waste site. Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves. Removal of part of geological heritage feature. Irreversible loss of moderate proportion of local high fertility soils. Requirement to excavate/remediate significant proportion of waste site. Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves. Removal of small part of geological heritage feature. Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils. Requirement to excavate/remediate small proportion of waste site. Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeological Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

Table 5 Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	**Small Adverse**	**Moderate Adverse**	**Large Adverse**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

APPENDIX 9.3
SITE INVESTIGATION REPORT

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

S.I. Ltd Contract No: 5648

Client:	Glenveagh Properties PLC
Engineer:	Barrett Mahony
Contractor:	Site Investigations Ltd

Howth Road,
Howth, Co. Dublin
Site Investigation Report

Prepared by:

.....

Stephen Letch

Issue Date:	27/11/2019
Status	Final
Revision	1

Contents:

Appendices:

1. Introduction

On the instructions of Barrett Mahony, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Howth Road, Howth, Co. Dublin. The investigation was for a new residential development of the site and was completed on behalf of the Client, Glenveagh Properties PLC. The investigation was started in October and completed in November 2019.

This report presents the factual geotechnical data obtained from the field and laboratory testing with interpretation of the ground conditions discussed.

2. Site Location

The site was located to the West of Howth on the Howth Road and was accessed through Deer Park Golf Course. Howth is located to the East of Dublin city and forms a peninsula into the Irish Sea. The first map below shows the location of the site in relation to the city centre and the second map shows the location of the site in Howth.

3. Fieldwork

The fieldworks comprised a programme of cable percussive boreholes and soakaway tests. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. Laboratory testing has been performed on representative soil samples recovered from the boreholes and these were completed in accordance of BS1377: 1990. The fieldworks comprised of the following:

- 7 No. cable percussive boreholes
- 7 No. soakaway tests

3.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 7 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The borehole depths were consistent in depth from 6.60mbgl (BH06) to 7.30mbgl (BH03). It was not possible to collect undisturbed samples due to the granular soils encountered so bulk disturbed samples were recovered at regular intervals.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g. BH01 at 1.20mbgl where N=6-(2,3/1,1,2,2)). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g. BH01 at 3.00mbgl where N=50-(25 for 125mm/50 for 35mm)).

The logs are presented in Appendix 1.

3.2. Soakaway Tests

Close to the borehole locations, 7 No. soakaway tests were completed and the tests carried out in accordance with BRE Special Digest 365. The soakaway pits were excavated using a wheeled excavator and were logged by a SIL geotechnical engineer. The soakaway test is used to identify possible areas for storm water drainage. The pit was filled with water and the level of the groundwater was recorded over time. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration.

The soakaway logs and photographs are presented in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 10 No. pH and sulphate content

The laboratory test results are presented in Appendix 3.

5. Ground Conditions

5.1. Overburden

The site ground conditions in the boreholes are consistent with cohesive soils dominating the site with light brown sandy slightly gravelly silty CLAY encountered at most locations. The SPT N-values are generally 10 or greater at 1.20mbgl, although BH01 and BH06 did record values of 6 and 5 respectively. The values also increased with depth across the site.

5.2. Groundwater

Groundwater details in the boreholes during the fieldworks are noted on the logs in Appendix 1. Groundwater was recorded in all of the boreholes ranging from 4.20mbgl to 4.70mbgl and the levels rose slightly after 20 minutes.

6.0. Recommendations and Conclusions

Please note the following caveats:

The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.

If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.

6.1. Shallow Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

The boreholes recorded cohesive CLAY soils at 1.20mbgl with SPT test results generally over 10 but values as low as 5 was recorded. Using a correlation proposed by Stroud and Butler between SPT N-values and plasticity indices, the SPT N-value can be used to calculate the undrained shear strength. No Atterberg limit tests were completed as part of the investigation but these soils have low to intermediate plasticity indices and therefore, the correlation of Cu=6N has been chosen. The undrained shear strength can be used to calculate the ultimate bearing capacity, and finally, a factor of safety of 3 is applied to get the allowable bearing capacity.

The table below shows the undrained shear strength, ultimate bearing capacity and allowable bearing capacity at 1.00mbgl and 2.00mbgl at each location.

Borehole No:	1.20mbgl				2.00mbgl			
	SPT	C_u	ULS	ABC	SPT	C_u	ULS	ABC
BH01	6	36	205	**70**	9	54	310	**105**
BH02	10	60	330	**110**	11	66	375	**125**
BH03	10	60	330	**110**	24	144	770	**255**
BH04	10	60	330	**110**	8	48	280	**95**
BH05	12	72	390	**130**	23	138	740	**245**
BH06	5	30	175	**60**	14	84	465	**155**
BH07	15	90	480	**160**	29	174	925	**310**

All values are kN/m^2.

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- Foundations are to be constructed on a level formation of uniform material type (described above).
- The bulk unit weight of the material in this stratum has a minimum density of $19kN/m^3$.
- All bearing capacity calculations allow for a settlement of 25mm.

The soakaway pits indicate that excavations in the cohesive soils should be stable for a short while at least. However, if granular soils or granular lenses are encountered then the likelihood of pit wall instability increases, and regular inspection of temporary excavations should be completed during construction to ensure that all slopes are stable. Temporary support should be used on any excavation that will be left open for an extended period.

6.2. Groundwater

The caveats below relating to interpretation of groundwater levels should be noted:
There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall, nearby construction and tides.

Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.

As discussed previously, groundwater was encountered in all the borehole locations at depths between 4.20mbgl to 4.70mbgl. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any seepages into excavations of the CLAY will be slow. If granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase.

If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

6.3. Aggressive Ground Conditions

The chemical test results in Appendix 3 indicate a general pH value between 8.04 and 8.34, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 126mg/l as SO_3. The BRE Special Digest 1:2005 – '*Concrete in Aggressive Ground*' guidelines require SO_4 values and after

conversion ($SO_4 = SO_3 \times 1.2$), the maximum value of 151mg/l shows Class 1 conditions and no special precautions are required.

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5648	**Cable Percussion Borehole Log**				Borehole No: **BH01**
Contract:	Howth Road	Easting:	727569.693	Date Started:	31/10/2019
Location:	Howth, Co. Dublin	Northing:	739346.250	Date Completed:	31/10/2019
Client:	Glenveagh Properties PLC	Elevation:	7.58	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		7.5	7.38					
0.5		Brown sandy slightly gravelly silty CLAY with low cobble content.		7.0						
1.0				6.5		1.00	B	JOT01		
	1.20				6.38	1.20	C	N=6 (2,3/1,1,2,2)		
1.5		Soft becoming firm brown sandy slightly gravelly silty CLAY with low cobble content.		6.0						
2.0				5.5		2.00	B	JOT02		
						2.00	C	N=9 (1,1/1,2,3,3)		
2.5				5.0						
	2.70				4.88					
3.0		Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.		4.5		3.00	B	JOT03		
						3.00	C	50 (25 for 125mm/50 for 35mm)		
3.5	3.50			4.0	4.08					
		Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.				4.00	B	JOT04		
4.0				3.5		4.00	C	N=33 (2,4/7,7,9,10)		
4.5				3.0					▼	
5.0				2.5		5.00	B	JOT05		
						5.00	C	N=34 (3,4/7,9,9,9)		
5.5				2.0						
6.0				1.5		6.00	B	JOT06		
						6.00	C	N=46 (5,6/9,12,12,13)		
6.5				1.0						
7.0						7.00	B	JOT07		
	7.10			0.5	0.48	7.00	C	50 (25 for 85mm/50 for 20mm)		
	7.20	Obstruction - possible boulders.			0.38	7.20	C	50 (25 for 5mm/50 for 0mm)		
7.5		Borehole terminated due to obstruction.		0.0						
		End of Borehole at 7.20m								
8.0				-0.5						
8.5				-1.0						
9.0				-1.5						
9.5				-2.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
2.70	2.80	00:45	4.70	4.60	NS	31/10	7.20	6.10				0.00	7.20	Arisings	Hand dug inspection pit to 1.20mbgl.
3.20	3.30	00:45													
7.10	7.20	01:00													

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5648	**Cable Percussion Borehole Log**			Borehole No: **BH02**
Contract:	Howth Road	Easting:	727620.170	Date Started: 01/11/2019
Location:	Howth, Co. Dublin	Northing:	739330.711	Date Completed: 01/11/2019
Client:	Glenveagh Properties PLC	Elevation:	7.38	Drilled By: J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status: FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			7.18					
0.5		Brown sandy slightly gravelly silty CLAY with low cobble content.		7.0		0.50	B	JOT08		
1.0	1.20			6.5	6.18	1.20	C	N=10 (1,1/2,2,3,3)		
1.5		Soft becoming firm brown sandy slightly gravelly silty CLAY with low cobble content.		6.0						
2.0				5.5		2.00	B	JOT09		
						2.00	C	N=11 (1,2/2,2,3,4)		
2.5	2.50			5.0	4.88					
3.0		Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.		4.5		3.00	B	JOT10		
						3.00	C	N=22 (2,4/4,5,6,7)		
3.5	3.50			4.0	3.88					
4.0		Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.		3.5		4.00	B	JOT11		
						4.00	C	N=44 (5,7/10,10,12,12)		
4.5				3.0						
5.0				2.5		5.00	B	JOT12		
						5.00	C	N=36 (4,6/7,9,9,11)		
5.5				2.0						
6.0				1.5		6.00	B	JOT13		
						6.00	C	N=44 (3,7/9,12,11,12)		
6.5				1.0						
7.0				0.5		7.00	B	JOT14		
	7.10				0.28	7.00	C	50 (25 for 100mm/50 for 5mm)		
	7.20	Obstruction - possible boulders.			0.18	7.20	C	50 (25 for 5mm/50 for 0mm)		
7.5		Borehole terminated due to obstruction.		0.0						
		End of Borehole at 7.20m								
8.0				-0.5						
8.5				-1.0						
9.0				-1.5						
9.5				-2.0						
				-2.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
4.70	4.80	00:45	4.70	4.60	5.60	01/11	7.20	Dry				0.00	7.20	Arisings	Hand dug inspection pit to 1.20mbgl.
7.10	7.20	01:00													

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5648	**Cable Percussion Borehole Log**			Borehole No: **BH03**
Contract:	Howth Road	Easting:	727650.112	Date Started: 04/11/2019
Location:	Howth, Co. Dublin	Northing:	739302.186	Date Completed: 05/11/2019
Client:	Glenveagh Properties PLC	Elevation:	8.59	Drilled By: J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status: FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		8.5	8.39					
0.5		Possible MADE GROUND: grey silty sandy gravel.		8.0						
	0.70				7.89					
1.0		Firm brown sandy slightly gravelly silty CLAY with low cobble content.		7.5		1.00	B	JOT15		
1.5						1.20	C	N=10 (2,2/2,2,3,3)		
	1.80			7.0	6.79					
2.0		Stiff becoming very stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.		6.5		2.00	B	JOT16		
2.5						2.00	C	N=24 (3,4/5,6,6,7)		
3.0				6.0		3.00	B	JOT17		
3.5				5.5		3.00	C	N=32 (3,4/7,7,9,9)		
4.0				5.0		4.00	B	JOT18	▼	
4.5				4.5		4.00	C	N=41 (5,6/10,9,11,11)	▽	
5.0				4.0		5.00	B	JOT19		
				3.5		5.00	C	50 (25 for 90mm/50 for 10mm)		
5.5	5.50	Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.		3.0	3.09					
6.0				2.5		6.00	B	JOT20		
6.5						6.00	C	50 (25 for 80mm/50 for 5mm)		
7.0				2.0		7.00	B	JOT21		
	7.10	Obstruction - possible boulders.		1.5	1.49	7.00	C	50 (25 for 95mm/50 for 5mm)		
	7.30	Borehole terminated due to obstruction. End of Borehole at 7.30m			1.29	7.30	C	50 (25 for 5mm/50 for 0mm)		
7.5				1.0						
8.0				0.5						
8.5				0.0						
9.0				-0.5						
9.5				-1.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:	Legend:
5.20	5.30	00:45	4.30	4.10	NS	04/11	4.00	Dry				0.00	7.30	Arisings	Hand dug inspection pit to 1.20mbgl.	B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
6.10	6.20	00:45				05/11	4.00	Dry								
7.10	7.30	01:00				05/11	7.50	4.10								

Contract No: 5648	**Cable Percussion Borehole Log**				Borehole No: **BH04**
Contract:	Howth Road	Easting:	727562.272	Date Started:	11/11/2019
Location:	Howth, Co. Dublin	Northing:	739302.844	Date Completed:	11/11/2019
Client:	Glenveagh Properties PLC	Elevation:	9.70	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0	0.20	TOPSOIL.		9.5	9.50					
0.5		Brown sandy slightly gravelly silty CLAY.		9.0						
1.0						1.00	B	JOT43		
	1.20	Firm brown sandy slightly gravelly silty CLAY with low cobble content.		8.5	8.50	1.20	C	N=10 (1,2/3,2,2,3)		
1.5				8.0						
2.0						2.00	B	JOT44		
				7.5		2.00	C	N=8 (1,1/1,2,2,3)		
2.5										
	2.70	Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.		7.0	7.00					
3.0						3.00	B	JOT45		
				6.5		3.00	C	50 (4,7/50 for 170mm)		
3.5	3.50	Stiff grey sandy slightly gravelly silty CLAY with low cobble content.			6.20					
4.0				6.0						
						4.00	B	JOT46		
4.5				5.5		4.00	C	N=25 (3,7/9,4,6,6)		
5.0				5.0						
						5.00	B	JOT47		
5.5				4.5		5.00	C	N=28 (4,4/5,7,7,9)		
				4.0						
6.0						6.00	B	JOT48		
				3.5		6.00	C	N=44 (5,7/9,11,12,12)		
6.5										
				3.0						
7.0	7.10					7.00	B	JOT49		
	7.20	Obstruction - possible boulders. Borehole terminated due to obstruction. End of Borehole at 7.20m		2.5	2.60 2.50	7.00 7.20	C C	50 (25 for 60mm/50 for 10mm) 50 (25 for 5mm/50 for 0mm)		
7.5										
8.0				2.0						
8.5				1.5						
9.0				1.0						
9.5				0.5						
				0.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth	Water Depth	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:	Legend:
4.70	4.80	00:45	4.70	4.50	NS	11/11	7.20	5.50				0.00	7.20	Arisings	Hand dug inspection pit to 1.20mbgl.	B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
7.10	7.20	01:00														

Contract No: 5648	**Cable Percussion Borehole Log**				Borehole No: **BH05**
Contract:	Howth Road	Easting:	727596.769	Date Started:	06/11/2019
Location:	Howth, Co. Dublin	Northing:	739273.657	Date Completed:	07/11/2019
Client:	Glenveagh Properties PLC	Elevation:	10.50	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			10.30					
0.5	0.60	MADE GROUND: brown sandy slightly gravelly silty clay with some red brick fragments.		10.0	9.90					
1.0		Firm brown sandy slightly gravelly silty CLAY with low cobble content.		9.5		1.00 1.20	B C	JOT29 N=12 (2,2/2,3,3,4)		
1.5	1.60	Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.		9.0	8.90					
2.0				8.5		2.00 2.00	B C	JOT30 N=23 (2,4/5,5,6,7)		
2.5	2.70	Stiff grey sandy slightly gravelly silty CLAY with low cobble content.		8.0	7.80					
3.0				7.5		3.00 3.00	B C	JOT31 N=41 (6,7/9,9,12,11)		
3.5				7.0						
4.0				6.5		4.00 4.00	B C	JOT32 N=41 (6,7/10,11,10,10)		
4.5	4.70	Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.		6.0	5.80					
5.0				5.5		5.00 5.00	B C	JOT33 50 (9,11/50 for 100mm)		
5.5				5.0						
6.0				4.5		6.00 6.00	B C	JOT34 50 (25 for 100mm/50 for 15mm)		
6.5				4.0						
7.0	7.10			3.5	3.40	7.00	B	JOT35		
	7.20	Obstruction - possible boulders. Borehole terminated due to obstruction. End of Borehole at 7.20m			3.30	7.00 7.20	C C	50 (25 for 85mm/50 for 5mm) 50 (25 for 5mm/50 for 0mm)		
7.5				3.0						
8.0				2.5						
8.5				2.0						
9.0				1.5						
9.5				1.0						

Chiselling:

From:	To:	Time:
5.30	5.40	00:45
6.30	6.40	00:45
7.10	7.20	01:00

Water Strikes:

Strike:	Rose:	Depth Sealed
4.10	4.00	NS

Water Details:

Date:	Hole Depth	Water Depth
06/11	3.00	Dry
07/11	3.00	Dry
07/11	7.20	4.10

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	7.20	Arisings

Remarks: Hand dug inspection pit to 1.20mbgl.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5648	**Cable Percussion Borehole Log**				Borehole No: **BH06**
Contract:	Howth Road	Easting:	727649.255	Date Started:	05/11/2019
Location:	Howth, Co. Dublin	Northing:	739275.640	Date Completed:	06/11/2019
Client:	Glenveagh Properties PLC	Elevation:	9.88	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			9.68					
		Brown sandy slightly gravelly silty CLAY.								
	0.70				9.18					
		Soft becoming firm brown sandy slightly gravelly silty CLAY with low cobble content.				1.00	B	JOT22		
						1.20	C	N=5 (1,1/1,1,1,2)		
						2.00	B	JOT23		
						2.00	C	N=14 (2,3/3,3,4,4)		
	2.50				7.38					
		Stiff becoming very stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.				3.00	B	JOT24		
						3.00	C	N=23 (2,4/5,5,6,7)		
						4.00	B	JOT25		
						4.00	C	N=31 (4,5/7,7,9,8)		
	4.40				5.48					
		Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.				5.00	B	JOT26		
						5.00	C	50 (25 for 125mm/50 for 15mm)		
						6.00	B	JOT27		
						6.00	C	N=50 (10,11/50 for 235mm)		
	6.50				3.38	6.50	B	JOT28		
	6.60	Obstruction - possible boulders.			3.28	6.60	C	50 (25 for 5mm/50 for 0mm)		
		Borehole terminated due to obstruction.								
		End of Borehole at 6.60m								

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:	Legend:
5.20	5.30	00:45	4.20	4.00	5.20	05/11	3.00	Dry				0.00	6.60	Arisings	Hand dug inspection pit to 1.20mbgl.	B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
6.50	6.50	01:00				06/11	3.00	Dry								
						06/11	6.60	Dry								

Contract No: 5648	**Cable Percussion Borehole Log**				Borehole No: **BH07**
Contract:	Howth Road	Easting:	727551.320	Date Started:	08/11/2019
Location:	Howth, Co. Dublin	Northing:	739274.500	Date Completed:	08/11/2019
Client:	Glenveagh Properties PLC	Elevation:	10.64	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		10.5	10.44					
		Brown sandy slightly gravelly silty CLAY.								
0.5	0.60			10.0	10.04					
		Firm brown sandy slightly gravelly silty CLAY with low cobble content.				1.00	B	JOT36		
1.0				9.5		1.20	C	N=15 (2,2/3,4,4,4)		
1.5				9.0						
	1.80				8.84					
2.0		Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.				2.00	B	JOT37		
2.5				8.5		2.00	C	N=29 (2,4/7,7,7,8)		
	2.90			8.0						
3.0		Stiff grey sandy slightly gravelly silty CLAY with low cobble content.			7.74	3.00	B	JOT38		
				7.5		3.00	C	N=39 (4,6/7,9,11,12)		
3.5				7.0						
4.0						4.00	B	JOT39		
				6.5		4.00	C	N=37 (4,6/7,8,10,12)		
4.5	4.60									
		Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.		6.0	6.04					
5.0						5.00	B	JOT40		
				5.5		5.00	C	47 (10,14/47 for 200mm)		
5.5				5.0						
6.0						6.00	B	JOT41		
				4.5		6.00	C	50 (25 for 125mm/50 for 25mm)		
6.5				4.0						
7.0	7.00				3.64	7.00	B	JOT42		
	7.10	Obstruction - possible boulders.		3.5	3.54	7.00	C	50 (25 for 50mm/50 for 20mm)		
		Borehole terminated due to obstruction.				7.10	C	50 (25 for 5mm/50 for 0mm)		
7.5		End of Borehole at 7.10m		3.0						
8.0				2.5						
8.5				2.0						
9.0				1.5						
9.5				1.0						

Chiselling:

From:	To:	Time:
5.40	5.50	00:45
6.30	6.40	00:45
7.00	7.10	01:00

Water Strikes:

Strike:	Rose:	Depth Sealed
4.20	4.10	5.50

Water Details:

Date:	Hole Depth:	Water Depth:
08/11	7.10	Dry

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	7.10	Arisings

Remarks: Hand dug inspection pit to 1.20mbgl.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Appendix 2

Soakaway Test Results and Photographs

SOAKAWAY TEST

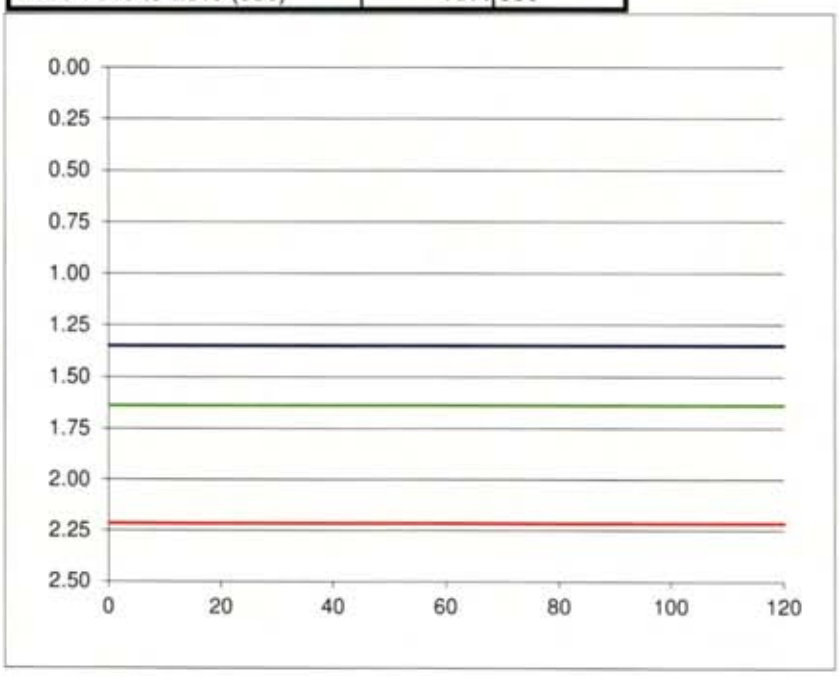
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA01
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.70	Firm brown slightly sandy gravelly silty CLAY with low cobble content.
0.70	2.50	Firm becoming stiff grey brown slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.35
0.5	1.35
1	1.35
1.5	1.35
2	1.35
2.5	1.35
3	1.35
3.5	1.35
4	1.35
4.5	1.35
5	1.35
6	1.35
7	1.35
8	1.35
9	1.35
10	1.35
12	1.35
14	1.35
16	1.35
18	1.35
20	1.35
25	1.35
30	1.35
40	1.35
50	1.35
60	1.35
75	1.35
90	1.35
120	1.35

Pit Dimensions (m)		
Length (m)	2.60	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.35	m
Depth of Water	1.15	m
75% Full	1.64	m
25% Full	2.21	m
75%-25%	0.58	m
Volume of water (75%-25%)	**1.35**	m3
Area of Drainage	**19.84**	m2
Area of Drainage (75%-25%)	**6.37**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

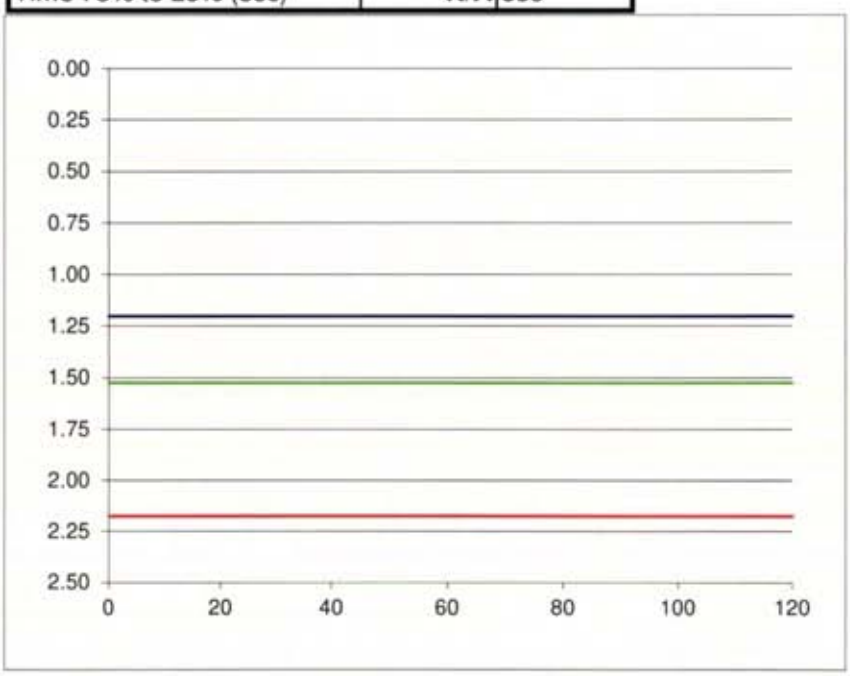
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA02
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.80	Firm light brown sandy slightly gravelly silty CLAY with low cobble content.
0.80	2.50	Firm grey brown slightly sandy gravelly silty CLAY with high cobble and medium boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.20
0.5	1.20
1	1.20
1.5	1.20
2	1.20
2.5	1.20
3	1.20
3.5	1.20
4	1.20
4.5	1.20
5	1.20
6	1.20
7	1.20
8	1.20
9	1.20
10	1.20
12	1.20
14	1.20
16	1.20
18	1.20
20	1.20
25	1.20
30	1.20
40	1.20
50	1.20
60	1.20
75	1.20
90	1.20
120	1.20

Pit Dimensions (m)		
Length (m)	2.50	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.20	m
Depth of Water	1.30	m
75% Full	1.53	m
25% Full	2.18	m
75%-25%	0.65	m
Volume of water (75%-25%)	**1.46**	m3
Area of Drainage	**19.25**	m2
Area of Drainage (75%-25%)	**6.67**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

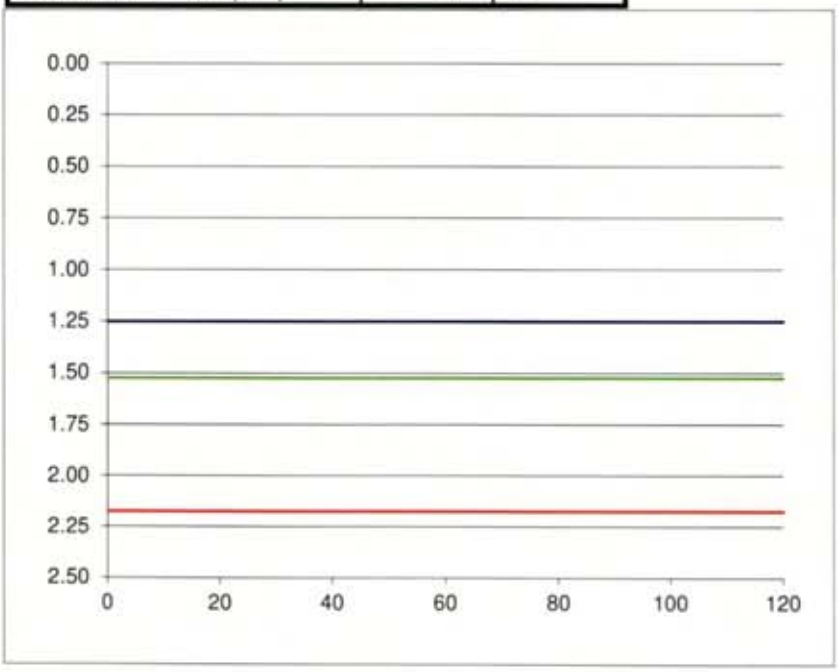
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA03
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.90	Grey brown silty sandy GRAVEL with high cobble content.
0.90	1.80	Firm light brown sandy slightly gravelly silty CLAY with medium cobble content.
1.80	2.50	Firm light brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.25
0.5	1.25
1	1.25
1.5	1.25
2	1.25
2.5	1.25
3	1.25
3.5	1.25
4	1.25
4.5	1.25
5	1.25
6	1.25
7	1.25
8	1.25
9	1.25
10	1.25
12	1.25
14	1.25
16	1.25
18	1.25
20	1.25
25	1.25
30	1.25
40	1.25
50	1.25
60	1.25
75	1.25
90	1.25
120	1.25

Pit Dimensions (m)		
Length (m)	2.40	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.20	m
Depth of Water	1.30	m
75% Full	1.53	m
25% Full	2.18	m
75%-25%	0.65	m
Volume of water (75%-25%)	**1.40**	m3
Area of Drainage	**18.66**	m2
Area of Drainage (75%-25%)	**6.45**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

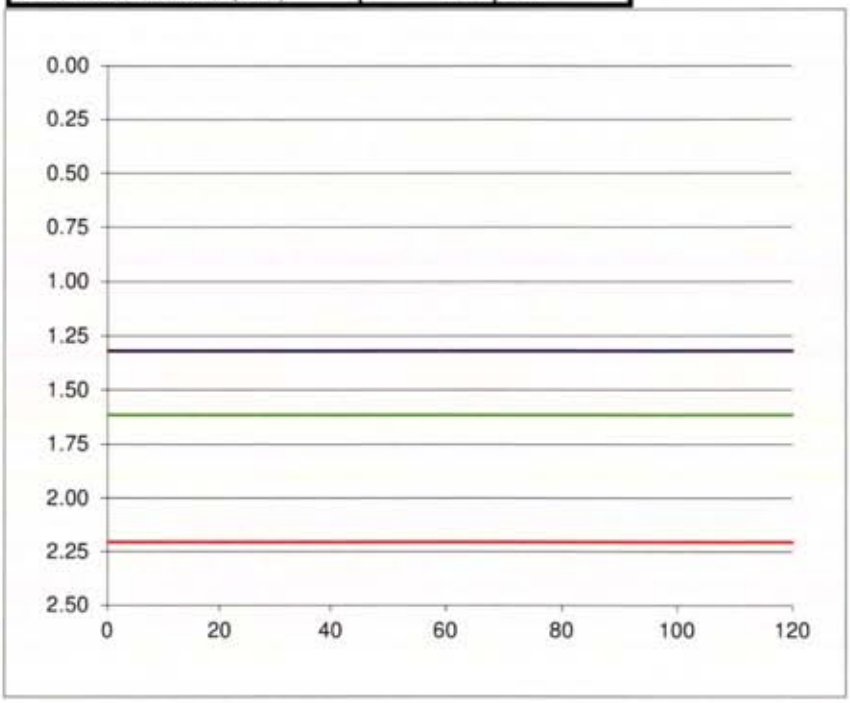
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA04
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	1.10	Firm light brown sandy slightly gravelly silty CLAY with low cobble content.
1.10	2.50	Firm brown grey slightly sandy gravelly silty CLAY with medium cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.32
0.5	1.32
1	1.32
1.5	1.32
2	1.32
2.5	1.32
3	1.32
3.5	1.32
4	1.32
4.5	1.32
5	1.32
6	1.32
7	1.32
8	1.32
9	1.32
10	1.32
12	1.32
14	1.32
16	1.32
18	1.32
20	1.32
25	1.32
30	1.32
40	1.32
50	1.32
60	1.32
75	1.32
90	1.32
120	1.32

Pit Dimensions (m)		
Length (m)	2.30	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.32	m
Depth of Water	1.18	m
75% Full	1.62	m
25% Full	2.21	m
75%-25%	0.59	m
Volume of water (75%-25%)	**1.22**	m3
Area of Drainage	**18.07**	m2
Area of Drainage (75%-25%)	**5.85**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

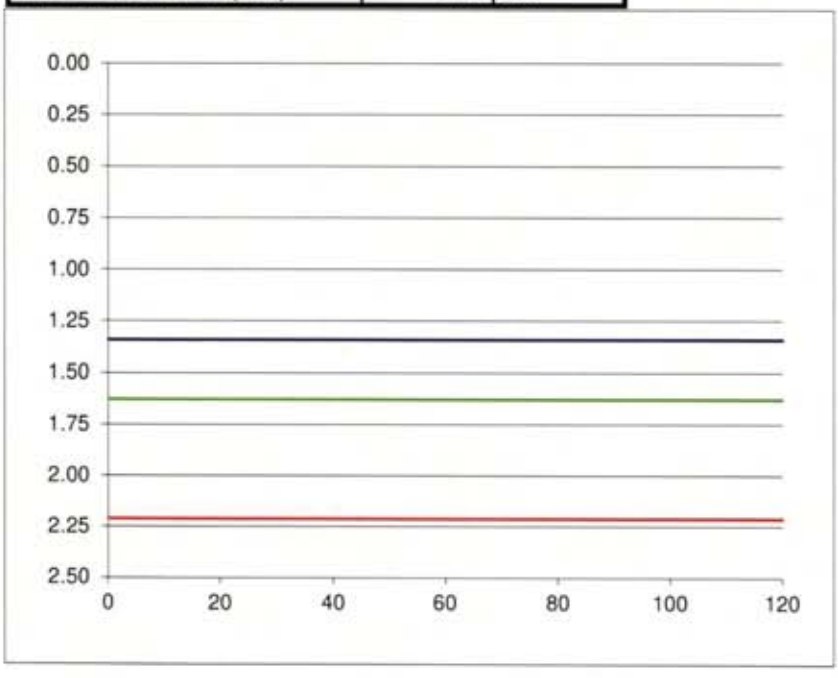
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA05
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.80	Firm light brown slightly sandy gravelly silty CLAY with low cobble content.
0.80	2.50	Firm becoming stiff brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.34
0.5	1.34
1	1.34
1.5	1.34
2	1.34
2.5	1.34
3	1.34
3.5	1.34
4	1.34
4.5	1.34
5	1.34
6	1.34
7	1.34
8	1.34
9	1.34
10	1.34
12	1.34
14	1.34
16	1.34
18	1.34
20	1.34
25	1.34
30	1.34
40	1.34
50	1.34
60	1.34
75	1.34
90	1.34
120	1.34

Pit Dimensions (m)		
Length (m)	2.60	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.34	m
Depth of Water	1.16	m
75% Full	1.63	m
25% Full	2.21	m
75%-25%	0.58	m
Volume of water (75%-25%)	**1.36**	m3
Area of Drainage	**19.84**	m2
Area of Drainage (75%-25%)	**6.40**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

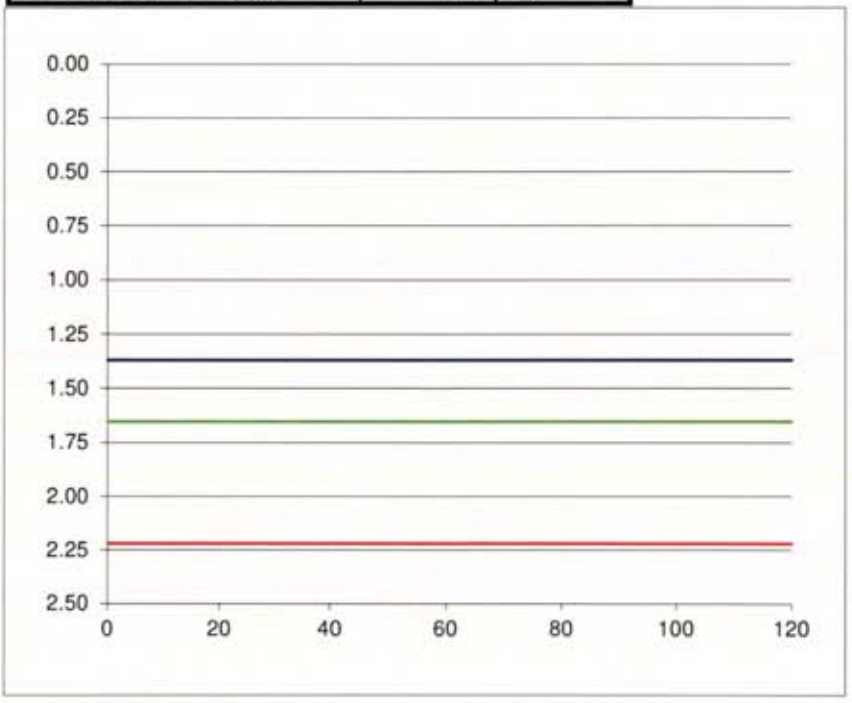
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA06
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	1.90	Firm brown slightly sandy gravelly silty CLAY with low cobble content.
1.90	2.50	Stiff grey brown slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.37
0.5	1.37
1	1.37
1.5	1.37
2	1.37
2.5	1.37
3	1.37
3.5	1.37
4	1.37
4.5	1.37
5	1.37
6	1.37
7	1.37
8	1.37
9	1.37
10	1.37
12	1.37
14	1.37
16	1.37
18	1.37
20	1.37
25	1.37
30	1.37
40	1.37
50	1.37
60	1.37
75	1.37
90	1.37
120	1.37

Pit Dimensions (m)		
Length (m)	2.70	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.37	m
Depth of Water	1.13	m
75% Full	1.65	m
25% Full	2.22	m
75%-25%	0.57	m
Volume of water (75%-25%)	**1.37**	m3
Area of Drainage	**20.43**	m2
Area of Drainage (75%-25%)	**6.498**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

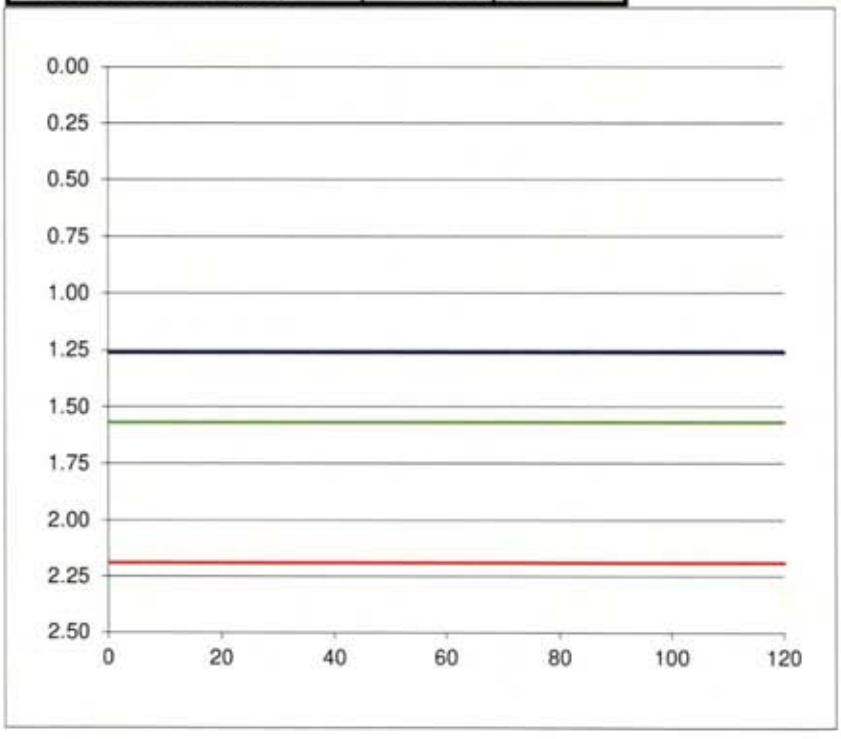
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA07
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	2.50	Firm brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.26
0.5	1.26
1	1.26
1.5	1.26
2	1.26
2.5	1.26
3	1.26
3.5	1.26
4	1.26
4.5	1.26
5	1.26
6	1.26
7	1.26
8	1.26
9	1.26
10	1.26
12	1.26
14	1.26
16	1.26
18	1.26
20	1.26
25	1.26
30	1.26
40	1.26
50	1.26
60	1.26
75	1.26
90	1.26
120	1.26

Pit Dimensions (m)		
Length (m)	2.20	m
Width (m)	0.90	m
Depth	2.50	m
Water		
Start Depth of Water	1.26	m
Depth of Water	1.24	m
75% Full	1.57	m
25% Full	2.19	m
75%-25%	0.62	m
Volume of water (75%-25%)	**1.23**	m3
Area of Drainage	**17.48**	m2
Area of Drainage (75%-25%)	**5.82**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SA01 Pit

SA01 Sidewall

SA01 Spoil

SA02 Pit

SA02 Sidewall

SA02 Spoil

SA03 Pit

SA03 Sidewall

SA03 Spoil

SA04 Pit

SA04 Sidewall

SA04 Spoil

SA05 Pit

SA05 Sidewall

SA05 Spoil

SA06 Pit

SA06 Sidewall

SA06 Spoil

SA07 Pit

SA07 Sidewall

SA07 Spoil

Appendix 3

Geotechnical Laboratory Test Results

Chemical Testing
In accordance with BS 1377: Part 3

Client	Glenveagh Properties Ltd.
Site	Howth Road
S.I. File No	5648 / 19
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	26th November 2019

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Loss on Ignition (Organic Content) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm	Remarks
BH01	1.00	JOT01	19/1463	8.16	0.123	0.093			75.9	
BH01	2.00	JOT02	19/1464	8.13	0.124	0.085			68.3	
BH02	0.50	JOT08	19/1465	8.12	0.123	0.099			80.6	
BH03	1.00	JOT15	19/1466	8.04	0.122	0.094			77.3	
BH04	1.00	JOT43	19/1467	8.13	0.122	0.108			88.6	
BH04	2.00	JOT44	19/1468	8.34	0.120	0.095			79.2	
BH05	1.00	JOT29	19/1469	8.13	0.122	0.100			81.9	
BH06	1.00	JOT22	19/1470	8.16	0.120	0.100			83.2	
BH06	2.00	JOT23	19/1471	8.10	0.126	0.094			74.7	
BH07	1.00	JOT36	19/1472	8.19	0.123	0.090			73.2	

Printed 26/11/2019

Paddy McGonagle
Site Investigations Ltd.

Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
BH01	727569.693	739346.250	7.58	327646.524	239321.181
BH02	727620.170	739330.711	7.38	327697.012	239305.639
BH03	727650.112	739302.186	8.59	327726.960	239277.108
BH04	727562.272	739302.844	9.70	327639.102	239277.766
BH05	727596.769	739273.657	10.50	327673.606	239248.573
BH06	727649.255	739275.640	9.88	327726.104	239250.556
BH07	727551.320	739274.500	10.64	327628.148	239249.415
Soakaway Tests					
SA01	727556.891	739349.071	7.68	327633.719	239324.003
SA02	727616.585	739323.768	8.19	327693.426	239298.695
SA03	727646.652	739302.093	8.83	327723.500	239277.015
SA04	727554.380	739306.570	9.78	327631.208	239281.492
SA05	727596.427	739268.765	10.65	327673.264	239243.680
SA06	727656.970	739273.897	10.13	327733.820	239248.813
SA07	727560.565	739278.538	10.67	327637.395	239253.454

Site Investigations Ltd
The Grange
12th Lock Road
Lucan
Co. Dublin
T: 01 6108768
e: info@siteinvestigations.ie

Contract No:	5648	Client:	Glenveagh Properties PLC
Contract Name:	Howth Road	Engineer:	Barrett Mahony
Location:	Howth, Co. Dublin	Scale:	1:1000
Title:	Site Plan	Drawn By:	SL

Legend Key

- Locations By Type - CP
- Locations By Type - IP

APPENDIX 9.4
GROUND INVESTIGATION REPORT

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

IGSL Ltd

GLL PRS Holdco. Ltd.

Ground Investigation Report

Project No. 25109

March 2024

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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (GLL PRS Holdco. Ltd, Deer Park) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015+A1:2020) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Principles for a classification
- EN ISO 14689-1:2017 Geotechnical Investigation and Testing – Identification, description & classification of rock

The Eurocode 7, Part 2 – Ground Investigation and Testing GI specification shall be read in conjunction with the Specification and Related Documents for Ground Investigation in Ireland, 2nd Edition, published by Engineers Ireland in 2016.

Reporting

No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for DOBA and the information should not be used without their prior written permission. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures

Where required, 'shell and auger' or cable percussive boring technique is employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing meet with the recommendations set out in IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

In-Situ Testing

Where required, Standard Penetration Tests (SPT's) are conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is

available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible, drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are

subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2017 and IS EN ISO 14688-2:2017. Rock weathering classification conforms to IS EN ISO 14689-1:2017 along with discontinuities (bedding planes, joints, cleavages, faults etc) as classified in Section 6.4 of IS EN ISO 14689-1:2017 and Annex C of same. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

Retention of Samples

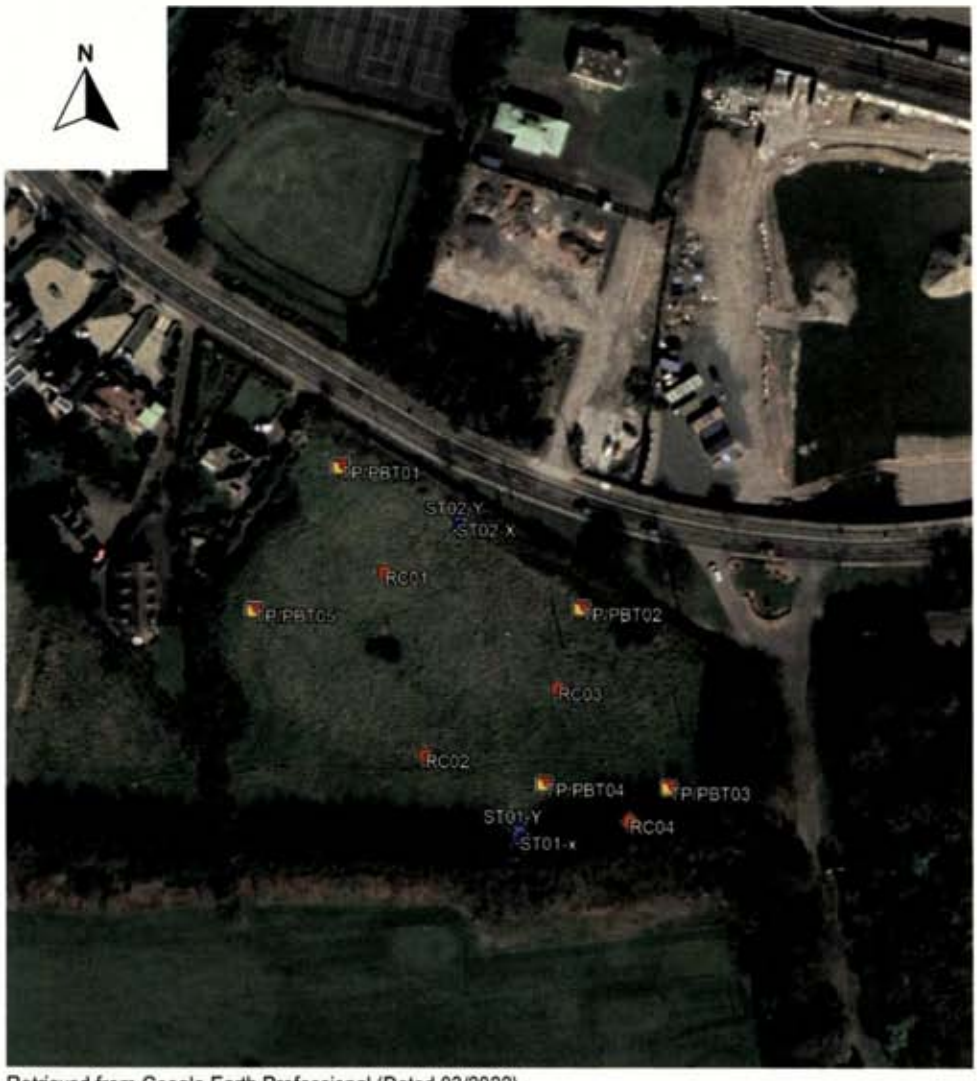
After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

1. INTRODUCTION

An investigation of subsoil conditions was undertaken by IGSL Limited at the site of a proposed development, termed the Marina Quarter at Deer Park, Howth, County Dublin (Figure 1). The works were undertaken for Donnachadh O'Brien and Associates Consulting Engineers [DOBA] on behalf of Marina Quarter Limited. The site is a greenfield site off the Howth Road, on the approach to Howth Castle / Howth Demesne and the nearby National Transport Museum.

Access to the site required crossing an existing fairway at Deer Park Golf Club. For this reason, bog mats were introduced in order to span the width of the fairway (See Figure 3). Underfoot ground conditions were extremely soft with specialist tracked dumpers required to move plant on site.

Figure 1 - Location Plan



Retrieved from Google Earth Professional (Dated 03/2022)

The investigations comprised machine-dug trial pits, rotary drilling, slit trenching and in situ plate bearing tests. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (2015+A1:2020) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

Geotechnical, chemical and environmental laboratory testing was scheduled on a range of soil samples. The geotechnical soil testing included moisture contents, Atterberg Limits and particle size distribution [PSD] testing in addition to hydrometer testing. Suites of both chemical testing and environmental testing were undertaken on soils. This report presents an interpretation of the data and an assessment of the key geotechnical issues. The exploratory hole locations are plotted on the site plan in Appendix 8.

Figure 2 – View east of site. *Inset:* **Tracked plant required to move equipment on site**

Figure 3 – Placement of Bag Mats across Deer Park Golf Club fairway (southern approach)

2. FIELDWORK

2.1 General

The fieldworks were undertaken in December 2023 and comprised the following:

- Trial Pit (5 No.)
- Rotary Drilling (4 No.)
- Slit Trenching (2 No.)
- Plate Bearing Testing (5 No.)
- Groundwater Monitoring
- Surveying of Exploratory Hole Locations

2.2 Trial Pits

Trial pitting was performed at five locations across the site. The trial pits were excavated, logged and sampled under the direction of an IGSL geotechnical engineer in accordance with BS 5930 (2015+A1:2020). Bulk disturbed samples (typically 20 to 30kg) were taken as the pits progressed.

The bulk samples were placed in heavy-duty polyethylene bags. The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs and photos are presented in Appendix 1 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls. Plate bearing tests were undertaken at 0.45m bgl in each of the opended pits (See Section 2.5).

2.3 Rotary Drilling

Rotary drilling was carried out (holes denoted RC_) at four locations using a tracked Comacchio GEO405 rig. Symmetrex drilling was utilised within the overlying superficial deposits (accompanied by SPT testing). Given the dearth of rock, open hole drilling was used solely to hole end depths of 15m bgl.

Standard Penetration Tests (SPT's) were performed in the drillholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. RC01 at 1.50m where N=13). These exclude the seating blow values, which represent the initial 150mm depth of penetration. No upper limit was set for cumulative blowcounts on single test drives and so no partial penetration records are reported. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio. The SPT energy ratio (E_r) calibration certificate is presented with the logs in Appendix 2.

Groundwater monitoring standpipes were installed in each of the four RC_ drillholes on site. The standpipes consisted of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement / bentonite grout seal. Headwork covers were concreted in place. The open hole log records are presented in Appendix 2.

2.4 Plate Bearing Tests

Plate load tests were caried out at five locations at a consistent depth of 0.45m below ground level [bgl]. The plate tests were positioned in each trial pit. The plate testing was undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used for the tests with kentledge provided by a mechanical excavator. Two load cycle tests were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 3.

2.5 Slit Trenching

Slit trenching was undertaken at two locations on the site (ST02 & ST02). The machine-assisted hand-dug trenches were opened to reveal the track of potential existing buried services.

Detailed records of the pit findings including depth, diameter and type of service (where found) are presented in Appendix 4. The soil profile provided on the slit trench logs describes the majority of the soils across the transverse trench. The location of trench extremities (X and Y) were surveyed to ITM using GPS techniques. Photographs taken during excavation are also presented with the logs in Appendix 4.

2.6 Groundwater Monitoring

The investigation saw the installation of standpipes in each of the four newly constructed exploratory drillholes. The standing groundwater levels in each of the installations was measured post fieldworks using an electric dipmeter. The levels recorded feature in Appendix 5.

2.7 Surveying of Exploratory Hole Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are incorporated on the exploratory hole logs with locations shown on the exploratory hole plans in Appendix 8.

3. LABORATORY TESTING

Geotechnical laboratory testing was carried out at IGSL's INAB-accredited laboratory in accordance with the methods set out in BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990. The laboratory applies best practice management systems as per International Standard IS EN ISO/IEC 17025. The geotechnical testing included moisture contents, Atterberg Limits, particle size distribution [PSD] and hydrometer testing. The results from geotechnical testing on selected trial pit soil samples are presented in Appendix 6.

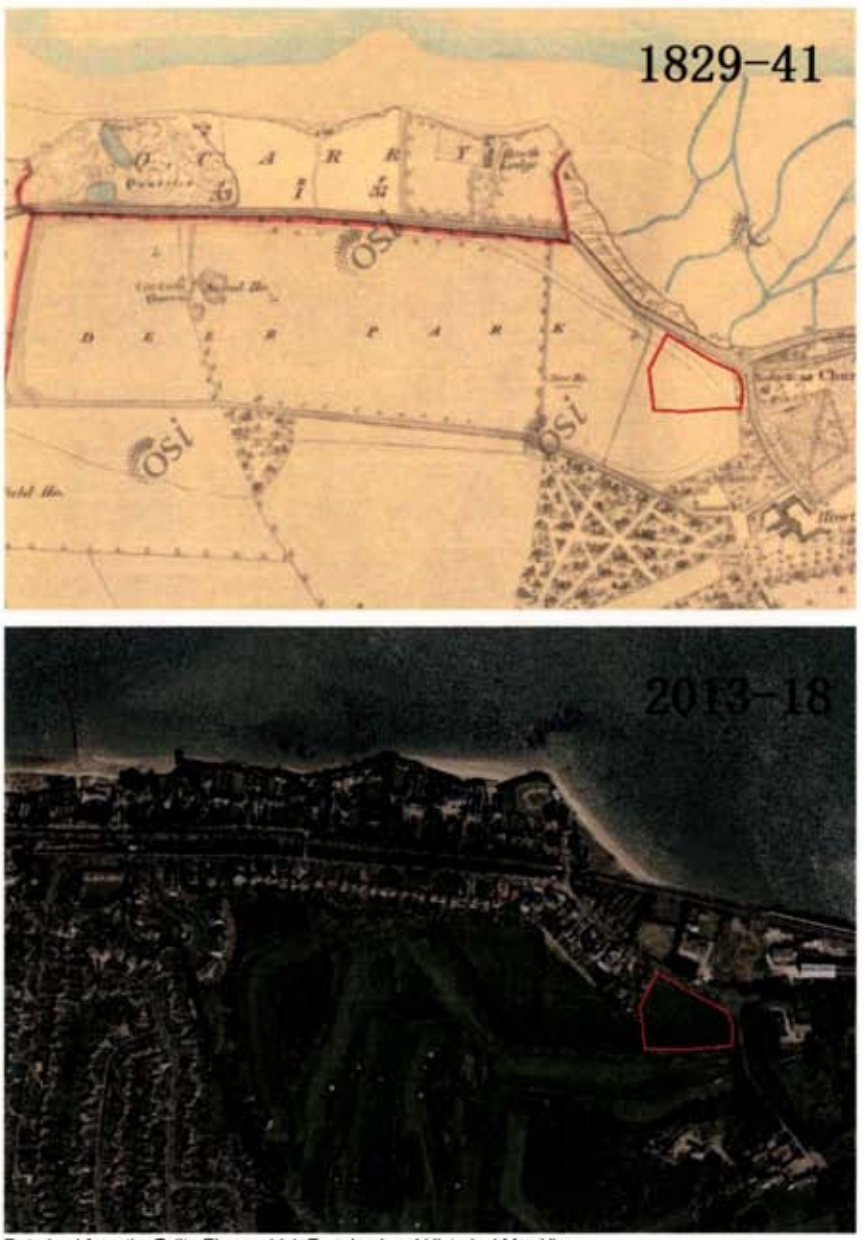
Chemical analysis incorporating BRE SD1 Suite B (Brownfield – Pyrite Present) was scheduled on recovered soils. The soil chemical results are presented in Appendix 7. A total of five soil samples were selected for Waste Acceptance Criteria (WAC) analysis as per the *Rilta* Suite of testing. The results can be used to classify the material with regard to its potential for disposal to landfill. The results are enclosed in the report in Appendix 7.

4. DESK STUDY

4.1 GSI / OSI Database Information

Reference to the OSI drawings from the nineteenth century (1829-41) shows the greenfield site as it is now except for the faint marking of a perimeter trackway which is noted as a '*Racecourse*'. The '*Racecourse*' was that of the Third Earl of Howth (Hurley, 2006). His interest in all things equine led him to install a herd of deer in Howth Demense for the purpose of stag hunting. This is how "Deer Park" was named thus. The Earl was so enthusiastic about horses he set up his own racecourse at the site from 1829 to 1842.

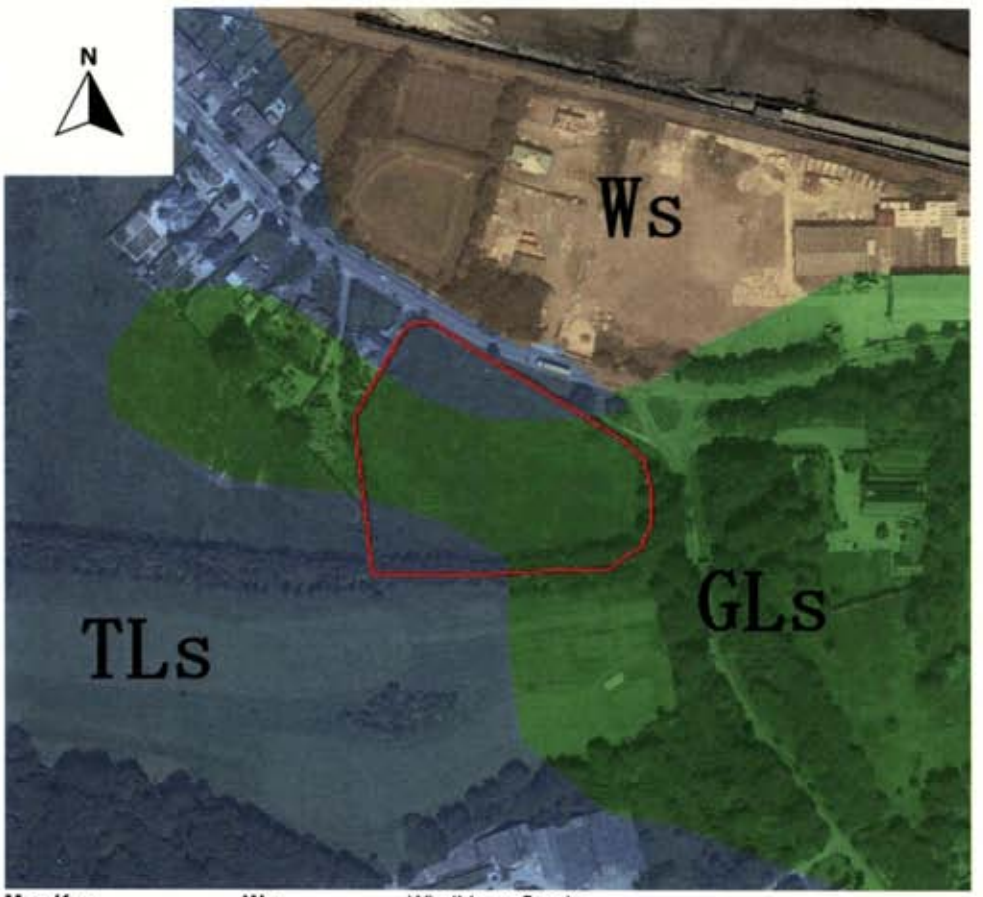
Figure 4 – Racecourse at 'Deer Park' depicted at the site in OSI drawings dated 1829-41. Tailte Eireann 2013-18 aerial orthophotograph also shown. Site outlined red.



Retreived from the Tailte Eireann Irish Townland and Historical Map Viewer

The Quaternary Soils plot for the area (Figure 5 - retrieved from GSI website) suggests gravelly deposits underlie the site. However, the main findings from pitting and from lab classification testing point to a cover of sandy slightly gravelly SILT and CLAY. Open hole drilling reaffirms the dominant gravelly CLAY composition to depths of 15m.

Figure 5 – Quaternary Soils Plot for the Howth Site



Map Key	**Ws**	- Windblown Sands
	TLs	- Till derived from Limestones
	GLs	- Gravels derived from Limestones

Reference to the GSI map for the area (Figure 6, 1:100,000 Solid Geology series) shows that the site is underlain by Lower Carboniferous, Waulsortin Limestones. The Waulsortian Limestone (WA) largely consists of calcareous mudstones, wackestones and packstones many of them containing original cavities (including stromatactis) filled with internal sediments and fibrous and blocky sparry cements (Sevastopulo 1982).

The very fine-grained carbonate lithology typical of the Waulsortian Limestones is also relatively pure and, in the right circumstances, amenable to dissolution and karst development. Blake et al (2015) suggest the Waulsortian limestone deposits within the Dublin Basin are massive and unbedded and are typically less prone to karstification. Waulsortian Limestone is also susceptible to Magnesium replacement and dolomitisation, which can further enhance permeability.

Figure 6 - Bedrock Geological Map for the Howth Site (retrieved from the GSI website)

Key:

WA	=	Waulsortian Limestone
BA	=	Ballysteen Formation

5. GROUND CONDITIONS & GROUNDWATER

5.1 Ground Profile – Superficial Deposits

The following is a summary of the ground conditions encountered across the site.

TOPSOIL

- A topsoil surface cover of 200mm was noted across the five trial pits. The soil was described as a soft brown sandy slightly gravelly CLAY with a low cobble content, frequent rootlets and rare ceramic fragments (2% anthropogenic fragments).

Possible ALLUVIUM / Glaciolacustrine Sediments

- Beneath the upper mantle of Topsoil, the natural subsoils were often reported as soft to firm initially in consistency. They were variably classified as SILT and CLAY-dominant deposits often with colour mottling of grey and orange. The soils in TP01 from 0.20m to 1.60m were logged as firm in consistency with similar firm soils reported in TP03 from 0.20m to 2.30m bgl.

- At TP02, the soils were reported to be increasingly silty and sandy with SAND remarked from 0.80m to 1.50m bgl.

GLACIAL DEPOSITS

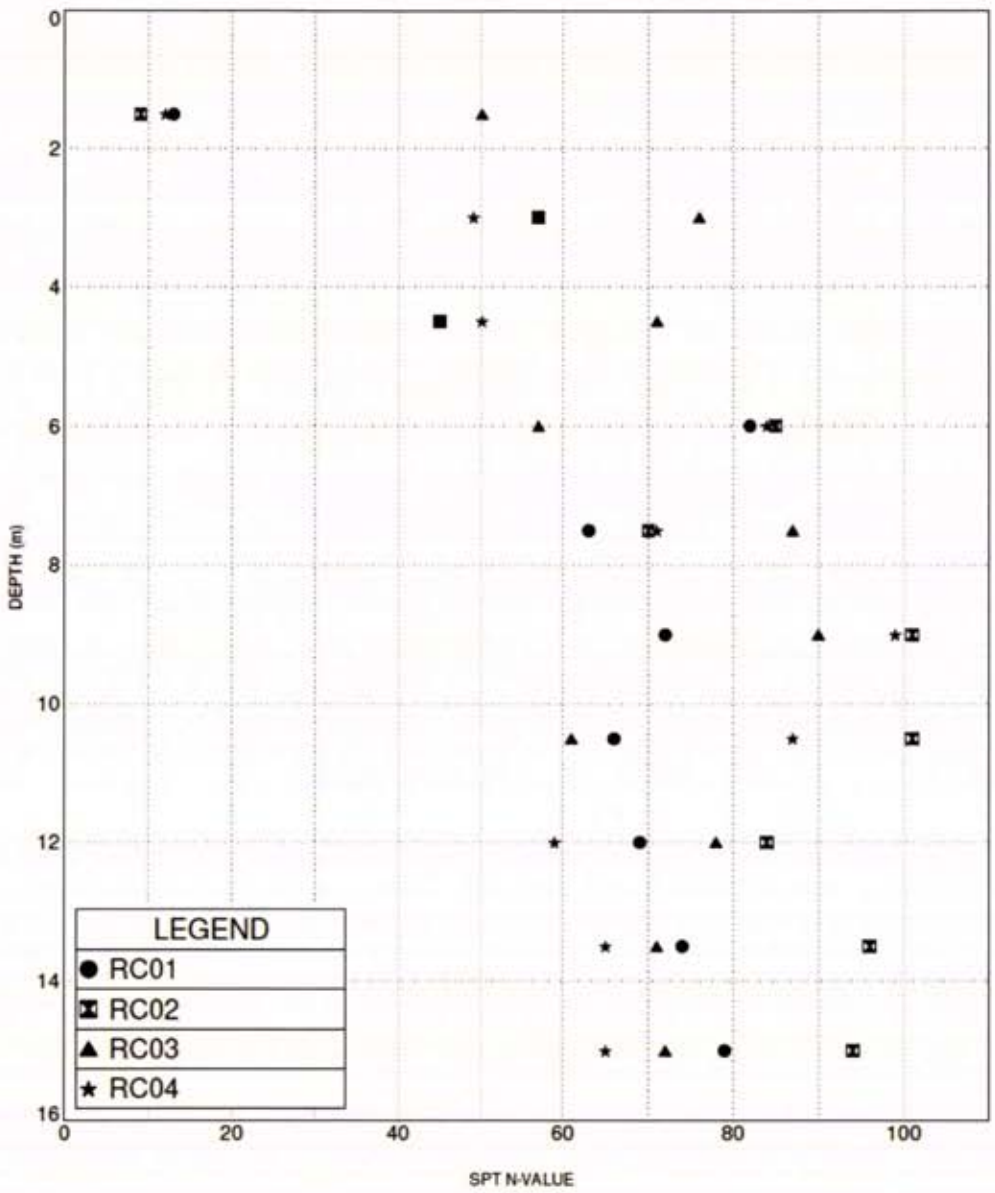
- At depth across pits TP01, TP02 and TP03, a firm to stiff CLAY entered the stratigraphy at levels ranging from 5.13m OD to 5.27m OD and in the case of TP03, on topographically higher ground, from 7.35m OD. These depths correspond to 1.60m to 2.30m.

- Both TP04 and TP05 ended in firm brownish grey and brown sandy slightly gravelly CLAY, both at a depths of 2.50m.

- In-situ testing was undertaken during the construction of the four drillholes. The standard penetration test [SPT] allows for an appraisal of the ground stiffness. A plot showing the blowcounts generated from testing at each hole is presented in Figure 7. Drillholes demonstrate the entry of the stiff to very stiff CLAY flagged by the higher SPT N-values obtained in test drives. Figure 7 shows that from 3.0m, the higher SPT N-values were consistently obtained indicative of stiff and very stiff CLAY deposits.

- The SPT plot highlights the soft to firm predominantly firm nature of soils in test drives performed in shallow overburden. 'Low strength' deposits are those where N values of <10 blows are present. With the exception of the test drive at 1.50m in RC02, no such blowcounts were recorded.

Figure 7 – SPT Plot versus Depth for Rotary Drillholes



Figures 8A & 8B – Sidewall profiles photographed during trial pitting. Fig 8A TP01 Topsoil over firm brownish grey locally mottled grey orange gravelly sandy SILT with cobbles to 1.60m bgl (5.27m OD). A firm to stiff slightly sandy gravelly CLAY was found to the pit end depth at 2.50m (4.37m OD). **Fig 8B** At TP02, Topsoil covers a gravelly silty SAND to 1.50m underlain by a firm brown sandy gravelly SILT. A firm to stiff brown slightly sandy slightly gravelly CLAY completes the pit from 2.20m to 2.50m (5.13m OD).

5.2 Bedrock

Consultation of the GSI map for the area suggests the bedrock underlying the site is that of the Waulsortian Limestone. Rotary drilling did not intercept rockhead at any of the four drillhole locations on site to a depth of 15m bgl. This depth equates to levels ranging -7m OD to -4.60m OD.

5.3 Groundwater

Water ingress was noted in open excavation in only one trial pit, TP04 as a seepage at a depth of 2.40m bgl (7.59m OD). In drillholes, there was a general absence of water strikes being recorded during hole construction.

Table 1 outlines where water was met but also highlights the levels measured post-works in rotary hole well installations. The potential does exist for there to be seasonal changes in groundwater level. The works were carried out during winter 2023.

Table 1 – Water measurements in on-site exploratory holes

	Exploratory Hole No.	Water Struck **m bgl** (m OD)	Stratum Description	Rate of Flow	Remarks / Stratum of water ingress (m OD)
Cable Percussion Boreholes	RC01	-	-	-	Water was dipped at **1.65m** bgl (6.35m OD) in the installation. (08-01-24)
	RC02	-	-	-	Water was dipped at **1.06m** bgl (9.26m OD) in the installation. (08-01-24)
	RC03	-	-	-	Water was dipped at **0.98m** bgl (8.15m OD) in the installation. (08-01-24)
	RC04	-	-	-	Water was dipped at **0.81m** bgl (9.60m OD) in the installation. (08-01-24)
Trial Pits	TP04	**2.40** (7.59)	Firm brownish grey, locally grey mottled orange sandy slightly gravelly CLAY with a medium cobble content	Seepage	Trial Pit remarked as 'Good'

6. GROUND ASSESSMENT & ENGINEERING RECOMMENDATIONS

6.1 General

In light of the ground investigation findings, the following geotechnical issues are developed and discussed:

- Foundations
- Groundwater
- Slopes / Batters
- Buried Concrete
- Pavement Construction
- Waste Acceptance Criteria [WAC] & Environmental Testing
  - *Soils destined for Landfill*

6.2 Foundations

The ground investigation findings demonstrate a sequence of generally firm fine-grained surficial soils mantling the site. From the Atterberg limit classification testing, the upper deposits vary from silt- to clay-dominant soils and are generally only slightly gravelly in composition. What appears to be a more gravelly till was intercepted at depth in each of trial pits TP01, TP02 and TP03 where the soils were described as being firm to stiff. The lower till was unearthed at depths ranging 1.60m to 2.30m corresponding to levels between 7.35m OD and 5.13m OD.

The findings from each of the four drillholes suggests a stiff to very stiff over-consolidated CLAY underlies the site from ca. 3.0m (second test drives in all rotary drillholes). The uppermost test drive at 1.50m depth reaffirms the generally firm nature of the uppermost soils. Depending on the envisaged loads, foundation footings is expected to be either located on the shallow subsoil (if lightly loaded) or at depth, likely between 2 to 3metres on overconsolidated till. The rotary drillholes indicate the till extends to at least 15m bgl (equating to levels ranging -7m OD to -4.60m OD).

The ground at ca. 1.0m depth should be classed as capable of providing a safe or allowable bearing capacity of 100 to 125kPa. Based on the visual observations made during trial pitting confirming the presence of a natural gravelly till underlying the site and on SPT N-Values, a safe or allowable bearing capacity of the order of 200kPa could be adopted for the high strength soils at depths of between 1.50 and 2.50m. This may vary somewhat laterally across the site given the topography. The underlying firm to stiff till appeared at a shallower depth in the topographically lower TP01. At bearing pressures of this magnitude, settlement (immediate elastic and long-term consolidation) would be expected to be <20mm.

Should the deeper-seated, higher strength till be selected as a founding stratum, the undertaking of a series of dynamic probes across the site would define more precisely the target dig depth ahead of groundworks.

If higher bearing capacities are required for development at the site, the rotary drillholes which, although not proving a definitive depth to rockhead, do illustrate a thick mantle of stiff to very stiff till beneath the site from ca. 3m to 15m bgl. The use of piles would eliminate the need to form excavations in potentially water-bearing, and subsequently unstable, near-surface soils (refer to Section 6.3). The use of a bored displacement pile system would curb the volume of arisings which would otherwise be generated using bored / CFA piles. However, advice should be sought from the piling contractor (or their designer) with regard to the most suitable pile type for the ground conditions.

Given the depth of rockhead (likely >15m bgl), it is expected that adequate embedment in the lower gravelly CLAY layer will mobilise skin friction and end bearing. Pile safe working load capacity (compression) should not be dependent on achieving end-bearing on the bedrock given its deep-seated profile. Trial piling in advance of production piling is advised to confirm embedment or

penetration depths and more importantly validate that settlements would be acceptable at design or safe working loads (SWL).

The pile designer should consider negative skin friction from the soft to firm / firm CLAY (potentially the upper 2m) on the selected piling technique. Floor slab loadings for the building unit are unknown. It is likely that introduction of SR21 Annex E compliant granular material will act as an adequate support for floor slabs given the performance recorded in near surface plate bearing tests, unless unusually high pressures are envisaged.

An engineered fill platform or piling mat to support the piling plant should be designed in accordance with BRE 470. The thickness and granular fill type (most likely T0 to SR21) should be selected for the ground conditions and specific rig loadings. It is assumed that imported granular fill used will remain in situ under the footprint of the building after piling works are completed, therefore it should meet the chemical and durability / soundness parameters listed in Annex E of SR21:2014+A1:2016. Drainage and maintenance are key factors or considerations in pile platform design and to ensure successful piling operations. It is noted that T0 will not permit free draining conditions, hence surface water management and maintenance of the piling is advised as set out in BRE 470. This will be especially important given the proven silt-dominant nature of the soils on site.

Further plate bearing tests could be undertaken across the site to assess the performance of the existing surficial soils with the results used design platform thickness. Compaction using a smooth drum roller without vibration with a mass per metre of roll of not less than 5400 kg should be used and achieve an improvement in the performance (stiffness) of the indigenous soils before constructing a piling platform.

The occurrence of silt on site will necessitate careful excavation. Should groundwater or surface water enter excavations, it is likely that dilation or bulging of the silts will occur. The issue with non-plastic silt-dominant tills is that once saturated and subsequently loaded / trafficked on, dilatant behaviour occurs with distinctive 'cow bellying' movement. This is often regarded on site as softening whereas it is merely a transient phase which can be avoided by applying a well-developed dig and drainage plan.

6.3 Groundwater

As noted in Section 5.3, a shallow groundwater strike was noted in only one of the five pits undertaken on site. At TP04, a seepage was recorded at 2.40m (7.59m OD). The absence of water entry in the remaining seven pits may be attributed to the permeability of the natural CLAY (or lack thereof). This should limit the ingress of groundwater where excavations are formed solely in fine soils. Therefore, shallow temporary excavation should generally see an absence of water ingress in natural deposits. It should be noted that groundwater can exist in perched waterbodies often hosted in isolated sand and gravel-bearing lenses.

Water was dipped in rotary drillhole installations post-works. The levels ranged from 0.81m bgl to 1.65m bgl equating to levels of 6.35m OD to 9.60m OD. The response zones in each of the wells extended to a depth of 15m bgl and so this should be taken into account when assessing the piezometric head evidenced in the recorded water levels.

Should water be encountered during deeper digs / excavations it is likely that de-watering will be required through a combination of strategic sump pumping and / or perimeter drains. As mentioned in Section 5.3, the potential does exist for there to be seasonal changes in groundwater level. The works were carried out during winter 2023. It may be the case that the various waterbodies at depth are subject to seasonal variations.

6.4 Slopes / Batters

A maximum temporary slope angle of 1V to 1.5H (33°) is anticipated for batters constructed within the upper medium strength fine grained soils. A slope angle of 1V to 2H (26°) should be appropriate for long term batters in the same soils. Minor instability was noted during pitting with sidewall collapse where shallow, more sand-prone soils were encountered. Where deep excavation works are required in the superficial deposits, the use of trench box support is advised. In addition, the uppermost fine subsoils will be susceptible to softening and degradation and surface water or groundwater ingress can lead to a significant reduction in shear strength. Perched water can exist locally and this should be considered in risk assessments for excavations.

Site operatives or personnel should not enter unsupported excavations and should be informed of potential risks. Where site operatives or engineering staff work in close proximity to temporary slopes or batters, these should be inspected and approved by a suitably experienced civil engineer, preferably with geotechnical experience. Where there is a risk of spalling of battered slopes, the use of a geogrid is recommended. The geogrid should be anchored at the top and bottom of the ridge face to contain particles such as gravel, cobbles and / or boulders that may become dislodged.

6.5 Buried Concrete

The chemical analysis tests on natural soil samples (BRE SD1 analysis suite) show pH (2.5:1) values ranging from 8.7 to 8.9. The sulphate aqueous extract (SO_4) results from trial pit samples determined values of <10mg/l. This would suggest the 'as-received' soil samples tested could be categorised as BRE Class DS-1.

Table C1 ACEC for greenfield sites in BRE SD 1 (2005) can be used in the selection and design of concrete. If mobile groundwater conditions prevail at the site and given the pH values obtained from the testing, then ACEC class AC-1^s would be expected to be appropriate for buried concrete in the soils. In line with I.S. EN 206-1:2013, concrete could be manufactured to Class XA1 where founded or positioned in the upper soils (Class XA1 being ≥ 2000 and ≤ 3000 SO_4^{2-} mg/kg).

6.6 Pavement Construction

Five plate load tests were conducted on the shallow subsoils at a depth of 0.45m bgl. The plate load test permits an assessment of the in-situ stiffness of the upper soil. The test results are reported in Appendix 3 of the report and are summarised below in Table 2. Equivalent CBR values of 1.9 to 9.5% were determined on the initial loading cycles (Cycle 1) with values of 2.1 to 11.5% on the reload cycles (Cycle 2). It should be noted that each plate load test was conducted on brown grey sandy gravelly cobbly CLAY soils, and in the case of PBT02, on gravelly clayey SAND.

Table 2 – Equivalent CBR % Values obtained in Plate Bearing Testing

Test No.	Depth	CBR at Load Cycle (%)	CBR at Re-Load (%)
PBT 01	0.45	4.3	6.9
PBT 02	0.45	9.5	10.2
PBT 03	0.45	4.6	6.7
PBT 04	0.45	9.2	11.5
PBT 05	0.46	1.9	2.1

Based on the plate load test results, and in accordance with the Design Guidance for Road Pavement (HD 25-26/10:2010), a conservative CBR design value of 2% is recommended for the near surface soils in their current state (despite the remaining four plate tests achieving a higher value). Ahead of road construction, and following static compaction of the soils, a further set of plate testing (450 or 600mm diameter) could be undertaken to assess the improvement in stiffness of the formation. Note that a dynamic compactive effort will likely promote dilatancy in the silt-dominant

soils. Given the slight improvement seen in testing (from load to reload), if the same test levels are again adopted it is likely that some improvement will be achieved. Likewise, should a deeper stratum be chosen as road formation level, there may be a marked improvement registered in subgrade quality, ie., a higher CBR value obtained in plate testing.

Assuming a design CBR value of 2% for the upper soils then a minimum 6F capping thickness of 500 to 600mm and a sub-base thickness (UGM) of 150mm is recommended to support road pavements. If or where very low strength subgrade occurs (CBR <1%) either geogrid reinforcement or the use of starter material (Class 6A / 6B) could be considered to provide a suitable foundation layer especially for access or haul / spine roads if they traverse low strength subgrades. Such a mechanically stabilized layer could consist of a layer of geogrid with 500 to 600mm of granular fill (well graded aggregate with maximum particle size of 75mm). Where geogrid is not utilized then approximately 500mm build-up of Class 6A / 6B starter layer material could be considered in conjunction with a capping layer (Class 6F capping in line with Series 600 of TII SRW). This should provide a satisfactory foundation layer to adequately support the subbase / pavement (150mm of unbound granular material (UGM) in accordance with Table 2.1 of CC-SPW-00800 (TII August 2022). The aforementioned Class 6A / 6B material could be used in conjunction with ca. 300mm of 6F capping material. This should provide a robust foundation layer.

The time of year will play a role in sub-grade strength especially during winter or early spring where heavy rainfall would cause degradation / wash-out of the formation or dilatancy in the silt. Oppositely, in summer, the performance of the soil subgrade may be significantly improved dependent on moisture content levels in the upper soil. If there are particular concerns regarding the condition of the formation soils, then additional plate bearing tests should be considered during construction to verify or validate the stiffness / density of the formation soils and adequate capping thickness.

The durability of the capping material should be confirmed as capping will be exposed to the elements (especially if the works are undertaken during the winter / spring period). It is important that argillaceous sedimentary rocks (i.e. muddy limestone, calcareous mudstone, shale, etc.) are not used as capping or as a starter layer. These have high potential to give rise to degradation (i.e. poor durability and soundness) and slaking and therefore would not be suitable.

All granular fills / unbound granular mixtures (UGM) used in pavement construction should be tested and approved in advance of being used in pavement construction. They should meet the compositional, chemical and soundness requirements as prescribed in the TII publication entitled Road Pavements – Unbound and Hydraulically Bound Mixtures (CC-SPW-00800 – dated August 2022).

Compaction / Placement of imported granular fill or hardcore should achieve a low air voids (<5%) and ensure that settlement is not an issue. The number of roller passes and mass per metre and width of roll should meet the guidelines in I.S. 888:2016 Annex B: Compaction requirements for unbound mixtures Table B.1. It is recommended to use a smooth drum roller (without vibration) with a mass per metre of roll of not less than 5400kg. Unbound mixtures should not be laid in layers greater than 150mm if using this compaction method.

6.7 Waste Acceptance Criteria [WAC] & Environmental Testing – *Soils destined for Landfill*

Five soil samples selected from trial pits TP01-TP05 were analysed for their compliance to the criteria set out in the 2002 European Landfill Directive (2003/33/EC). The natural soil samples proved compliant with Waste Acceptance Criteria and therefore would be accepted by an inert landfill.

The results obtained from the testing were also compared with published limits set out in the EPA Guidance on waste acceptance criteria at authorized soil recovery facilities (EPA, 2020). The samples were found to meet each of the criteria set for Total Organic Carbon and for the organic compounds BTEX, Mineral Oil, PAH and PCB's.

In relation to total metal concentrations, the EPA Guidance document employs a set of specific metal trigger limits to each of seven geochemical domains across the country. Depending on the domain in which the accepting recovery site falls, there are specific limits prescribed for certain metals. In order to further analyse the soils' suitability for acceptance at an EPA recovery facility, the domain of the receiving facility would have to be known. For the purposes of this report, given the Quaternary soils map (Figure 3) indicates Carboniferous limestone derived till on site, the maximum concentrations and / or trigger levels in soil and stone for soil recovery facilities for Geochemical Domain 2 (Carboniferous limestone and related rocks) are applied. The samples meet the metal concentrations published for Geochemical Domain 2 and would therefore, based on metal and TOC / organic compound contents be accepted at an authorized soil recovery facility.

Furthermore, written into the EPA (2002) document, only "soil and stone containing up to 2% non-natural materials by weight is acceptable, ie., anthropogenic or man-made substances such as rubble, concrete, bricks, metal and bitumen that are non-natural to the environment from which the material was extracted". This 2% content level for man-made materials would have to be complied with should the soils be exported to an EPA-licenced Soil Recovery Facility. Any anthropogenic fragments would have to be screened from soils prior to removal from site.

In relation to sending the analysed samples to an EPA-licenced Soil Recovery Facility, the limits for acceptance at the nominated facility should be checked against the results listed in the test record sheet - final report.

Note that, depending on the extent and depth of envisaged excavations and quantities for soil removal (if required), a landfill or Soil Recovery Facility may require additional testing to achieve the frequency of analysis (i.e. number of samples per unit volume of excavation) that meets their licence requirements.

No asbestos was detected in the screen ran on the samples.

REFERENCES

1.0 Blake, S., Jones, A.G., Henry, T., & Kalscheuer, T., & IRETHERM Team (2015). A multi-disciplinary investigation of Irish warm springs and their potential for geothermal energy provision. Proceedings World Geothermal Congress 2015 Melbourne, Australia

2.0 BS 5930 (2015+A1:2020) Code of Practice for Site Investigation, British Standards Institution (BSI).

3.0 BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.

4.0 Eurocode 7, Part 2: Ground Investigation & Testing (EN 1997-2:2007)

5.0 Hurley, M. J. (2006). Baldoyle as a Racecourse Village. Dublin Historical Record, 59(1), 65–80. http://www.jstor.org/stable/30101607

6.0 Irish Standard IS 888:2016, NSAI (Published in March 2016)

7.0 Sevastopulo, G.D. (1982). The age and depositional setting of Waulsortian Limestones in Ireland. In: Le Mone, D.V. (ed.) Symposium on the paleoenvironmental setting and distribution of the Waulsortian Facies. University of Texas at El Paso and El Paso Geological Society. 65-79.

8.0 Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

9.0 Sowers, G.F. (1962) Shallow Foundations, Foundation Engineering, McGraw Hill

10.0 SR21:2014+A1:2016 Guidance on the use of IS EN 13242+A1:2007

11.0 Terzaghi, K., Peck, R.B., & Mesri, G. (1996). Soil Mechanics in Engineering, 3rd Edition. New York, Wiley.

Appendix 1

Trial Pit Logs & Photographs

TRIAL PIT RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	CQ	**CO-ORDINATES**	727,564.62 E 739,364.02 N
		DATE STARTED	07/12/2023
		DATE COMPLETED	07/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**GROUND LEVEL (m)**	6.87
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 3CX

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL: Soft brown sandy CLAY with rare gravel and cobbles. Sand is fine to coarse. Frequent rootlets. Rare fine gravel sized red ceramic fragments (less than 2% of non-natural material).		0.20	6.67						
	Firm brownish grey locally mottled grey orange gravelly sandy SILT with medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.									
1.0						AA192494	B	1.00		
	Firm to stiff brown slightly sandy slightly gravelly CLAY with a medium cobble content (becoming high cobble content from 2.0m bgl). Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		1.60	5.27						
2.0						AA192495	B	2.00		
	End of Trial Pit at 2.50m		2.50	4.37						

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	CQ	**CO-ORDINATES**	727,630.38 E 739,327.55 N
		DATE STARTED	07/12/2023
		DATE COMPLETED	07/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**GROUND LEVEL (m)**	7.33
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content, frequent rootlets and rare fine gravel-sized red ceramic fragments (< 2% non-natural material). Sand is fine to coarse.		0.20	7.13		AA192496	B	0.20-0.80		
Brownish grey slightly gravelly silty SAND to sandy silt. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded.		0.80	6.53						
1.0 Brownish grey silty gravelly SAND with a high cobble content and low boulder content. Cobbles and boulders are subrounded (up to 300mm). Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		1.50	5.83		AA192497	B	1.50		
2.0 Firm brown sandy gravelly SILT with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		2.20	5.13						
Firm to stiff brown slightly sandy slightly gravelly CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		2.50	4.83		AA192498	B	2.50		
End of Trial Pit at 2.50m									

Groundwater Conditions
Dry

Stability
Poor stability from 0.40m bgl

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	CQ	**CO-ORDINATES**	727,654.68 E 739,280.47 N
		DATE STARTED	08/12/2023
		DATE COMPLETED	08/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**GROUND LEVEL (m)**	9.65
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content and frequent rootlets, rare plastic bag and rare fine gravel-sized red ceramic fragments (<2% non-natural material). Sand is fine to coarse.		0.20	9.45						
Firm brown slightly gravelly sandy CLAY with a low cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular.									
1.0					AA197452	B	1.00		
2.0					AA197453	B	2.00		
Firm to stiff brown sandy slightly gravelly CLAY with a medium cobble content (becoming high cobble content from 2.50m bgl). Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		2.30	7.35		AA197454	B	2.30-2.50		
End of Trial Pit at 2.50m		2.50	7.15						

Groundwater Conditions
Dry

Stability
Good

General Remarks

IGSL TP LOG 25109.GPJ IGSL.GDT 5/3/24

TRIAL PIT RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	CQ	**CO-ORDINATES**	727,621.22 E 739,280.61 N
		DATE STARTED	08/12/2023
		DATE COMPLETED	08/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**GROUND LEVEL (m)**	9.99
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content and frequent rootlets. Sand is fine to coarse.									
Soft to firm brownish grey gravelly sandy CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		0.20	9.79		AA197455	B	0.20-0.90		
1.0 Firm brown gravelly sandy CLAY with a medium cobble content and frequent grey silty sand pockets (up to 200mm). Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		0.90	9.09		AA197456	B	1.00		
Firm brownish grey, locally grey mottled orange sandy slightly gravelly CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.		1.40	8.59						
2.0					AA197457	B	2.00		
				1 (Seepage)					
End of Trial Pit at 2.50m		2.50	7.49						

Groundwater Conditions
Water entry at 2.40m bgl

Stability
Good

General Remarks

IGSL TP LOG 25109.GPJ IGSL.GDT 5/3/24

TRIAL PIT RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	CQ	**CO-ORDINATES**	727,542.32 E 739,324.73 N
		DATE STARTED	07/12/2023
		DATE COMPLETED	07/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**GROUND LEVEL (m)**	8.65
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content and frequent rootlets and rare fine gravel-sized red ceramic fragments (<2% non-natural material). Sand is fine to coarse.		0.20	8.45						
Soft to firm and firm brown gravelly sandy CLAY with a low cobble content. Cobbles and boulders are subrounded (up to 300mm). Sand is fine to coarse. Gravel is fine to coarse subangular.					AA192492	B	1.00		
2.0 Firm brown sandy slightly gravelly CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular.		1.90	6.75		AA192493	B	2.00		
End of Trial Pit at 2.50m		2.50	6.15						

Groundwater Conditions
Dry

Stability
Good

General Remarks

TP01 – 1 of 4

TP01 – 2 of 4

TP01 – 3 of 4

TP01 – 4 of 4

TP02 – 1 of 4

TP02 – 2 of 4

TP02 – 3 of 4

TP02 – 4 of 4

TP03 – 1 of 4

TP03 – 2 of 4

TP03 – 3 of 4

TP03 – 4 of 4

TP04 – 1 of 4

TP04 – 2 of 4

TP04 – 3 of 4

TP04 – 4 of 4

TP05 – 1 of 4

TP05 – 2 of 4

TP05 – 3 of 4

TP05 – 4 of 4

Appendix 2

Rotary Drillhole Logs / SPT Calibration Sheet (Er)

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC01
		SHEET	Sheet 1 of 4
CO-ORDINATES	727,577.08 E 739,335.97 N	**DATE COMMENCED**	13/12/2023
GROUND LEVEL (mOD)	8.00	**DATE COMPLETED**	13/12/2023
RIG TYPE	GEO-405		
CLIENT	GLL PRS Holdco. Ltd.	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY				
1	1.50	0	0	0						1.50			
2									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY		6.50		N = 13 (1, 2, 2, 3, 4, 4)
3	3.00	0	0	0									N = 57 (6, 7, 11, 17, 14, 15)
4	4.50	0	0	0						4.50			
									SYMMETRIX DRILLING: No recovery, observed by driller as returns of cobbly CLAY		3.50		N = 45 (4, 8, 12, 9, 10, 14)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
13-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 2 of 4
CO-ORDINATES	727,577.08 E 739,335.97 N		
GROUND LEVEL (mOD)	8.00	**DATE COMMENCED**	13/12/2023
RIG TYPE	GEO-405	**DATE COMPLETED**	13/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**DRILLED BY**	IGSL - AK
		HOLE DIAMETER (mm)	78

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
5		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of cobbly CLAY *(continued)*				
	6.00												
6		0	0	0									N = 82 (9, 11, 28, 19, 17, 18)
7	7.50												
		0	0	0									N = 63 (5, 7, 9, 14, 19, 21)
8													
9	9.00	0	0	0									N = 72 (6, 24, 19, 21, 15, 17)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
13-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC01
		SHEET	Sheet 3 of 4
CO-ORDINATES	727,577.08 E 739,335.97 N		
GROUND LEVEL (mOD)	8.00	**RIG TYPE**	GEO-405
		DATE COMMENCED	13/12/2023
		DATE COMPLETED	13/12/2023
CLIENT	GLL PRS Holdco. Ltd.	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**DRILLED BY**	IGSL - AK
		HOLE DIAMETER (mm)	78

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10									SYMMETRIX DRILLING: No recovery, observed by driller as returns of cobbly CLAY *(continued)*				
	10.50												N = 66 (3, 17, 12, 20, 15, 19)
11		0	0	0									
	12.00												
12													N = 69 (5, 9, 15, 17, 17, 20)
		0	0	0									
13													
	13.50												N = 74 (2, 19, 28, 13, 18, 15)
14		0	0	0									
	15.00									15.00			

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

End of Borehole at 15.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
13-12-23	15.00	1.00	15.00	50mm SP

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 4 of 4
CO-ORDINATES	727,577.08 E 739,335.97 N	**DATE COMMENCED**	13/12/2023
GROUND LEVEL (mOD)	8.00	**DATE COMPLETED**	13/12/2023
RIG TYPE	GEO-405		
INCLINATION (deg)	-90	**DRILLED BY**	IGSL - AK
CLIENT	GLL PRS Holdco. Ltd.		
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
15											-7.00		N = 79 (8, 11, 15, 19, 24, 21)
16													
17													
18													
19													

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
13-12-23	15.00	1.00	15.00	50mm SP

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC02
		SHEET	Sheet 1 of 4
CO-ORDINATES	727,589.02 E 739,287.34 N	**DATE COMMENCED**	08/10/2023
GROUND LEVEL (mOD)	10.32	**DATE COMPLETED**	08/10/2023
RIG TYPE	GEO-405		
CLIENT	GLL PRS Holdco. Ltd.	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0									SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY				
1	1.50	0	0	0						1.50			
									SYMMETRIX DRILLING: No recovery, observed by driller as returns of sandy gravelly CLAY		8.82		N = 9 (1, 2, 2, 3, 2, 2)
2	3.00	0	0	0						3.00			
3									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY		7.32		N = 57 (7, 9, 13, 13, 14, 17)
4	4.50	0	0	0						4.50			
									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY		5.82		N = 45 (6, 8, 10, 10, 11, 14)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
08-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 2 of 4
CO-ORDINATES	727,589.02 E 739,287.34 N	**DATE COMMENCED**	08/10/2023
GROUND LEVEL (mOD)	10.32	**DATE COMPLETED**	08/10/2023
RIG TYPE	GEO-405		
INCLINATION (deg)	-90	**DRILLED BY**	IGSL - AK
CLIENT	GLL PRS Holdco. Ltd.		
ENGINEER	DOBA		
HOLE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
5		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY *(continued)*				
	6.00									6.00			
6									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY		4.32		N = 85 (7, 16, 32, 17, 17, 19)
		0	0	0									
7	7.50												N = 70 (7, 7, 10, 21, 18, 21)
8		0	0	0									
	9.00												
9		0	0	0									N = 101 (3, 7, 30, 26, 21, 24)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
08-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 3 of 4
CO-ORDINATES	727,589.02 E 739,287.34 N		
GROUND LEVEL (mOD)	10.32	**DATE COMMENCED**	08/10/2023
		DATE COMPLETED	08/10/2023
CLIENT	GLL PRS Holdco. Ltd.	**RIG TYPE**	GEO-405
ENGINEER	DOBA	**INCLINATION (deg)**	-90
		HOLE DIAMETER (mm)	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY *(continued)*				
	10.50												N = 101 (6, 9, 24, 27, 24, 26)
11		0	0	0									
	12.00												N = 84 (5, 8, 12, 24, 26, 22)
12		0	0	0									
13	13.50												N = 96 (5, 7, 16, 29, 24, 27)
14		0	0	0									
	15.00									15.00			

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

End of Borehole at 15.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
08-12-23	15.00	1.00	15.00	50mm SP

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 4 of 4
CO-ORDINATES	727,589.02 E 739,287.34 N		
GROUND LEVEL (mOD)	10.32	**RIG TYPE**	GEO-405
		INCLINATION (deg)	-90
CLIENT	GLL PRS Holdco. Ltd.	**DATE COMMENCED**	08/10/2023
ENGINEER	DOBA	**DATE COMPLETED**	08/10/2023
		HOLE DIAMETER (mm)	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
15											-4.68		N = 94 (4, 8, 14, 23, 27, 30)
16													
17													
18													
19													

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
08-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC03
		SHEET	Sheet 1 of 4
CO-ORDINATES	727,624.35 E 739,306.15 N	**DATE COMMENCED**	12/11/2023
GROUND LEVEL (mOD)	9.13	**DATE COMPLETED**	12/11/2023
RIG TYPE	GEO-405		
CLIENT	GLL PRS Holdco. Ltd.	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY				
1	1.50	0	0	0									N = 50 (4, 6, 9, 15, 12, 14)
2		0	0	0									
3	3.00	0	0	0									N = 76 (3, 11, 21, 19, 17, 19)
4	4.50												N = 71 (5, 9, 14, 21, 16, 20)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-11-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC03
		SHEET	Sheet 2 of 4
CO-ORDINATES	727,624.35 E 739,306.15 N	**DATE COMMENCED**	12/11/2023
GROUND LEVEL (mOD)	9.13	**DATE COMPLETED**	12/11/2023
RIG TYPE	GEO-405		
CLIENT	Marina Quarter Limited	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
5		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY *(continued)*				
6	6.00	0	0	0									N = 57 (4, 7, 9, 17, 15, 16)
7	7.50	0	0	0									N = 87 (7, 19, 29, 23, 15, 20)
8		0	0	0									
9	9.00	0	0	0									N = 90 (5, 11, 15, 21, 24, 30)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-11-23	15.00	1.00	15.00	50mm SP

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 3 of 4
CO-ORDINATES	727,624.35 E 739,306.15 N		
GROUND LEVEL (mOD)	9.13	**RIG TYPE**	GEO-405
		DATE COMMENCED	12/11/2023
		DATE COMPLETED	12/11/2023
CLIENT	Marina Quarter Limited	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY *(continued)*				N = 61 (12, 28, 15, 17, 14, 15)
11		0	0	0									
12	12.00												N = 78 (4, 11, 19, 16, 19, 24)
13		0	0	0									
14	13.50												N = 71 (14, 19, 21, 12, 18, 20)
		0	0	0									
	15.00									15.00			

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

End of Borehole at 15.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-11-23	15.00	1.00	15.00	50mm SP

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 4 of 4
CO-ORDINATES	727,624.35 E 739,306.15 N	**DATE COMMENCED**	12/11/2023
GROUND LEVEL (mOD)	9.13	**DATE COMPLETED**	12/11/2023
RIG TYPE	GEO-405		
CLIENT	Marina Quarter Limited	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
15											-5.87		N = 72 (2, 11, 15, 19, 21, 17)
16													
17													
18													
19													

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-11-23	15.00	1.00	15.00	50mm SP

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC04**
		SHEET	Sheet 1 of 4
CO-ORDINATES	727,644.28 E 739,271.49 N		
GROUND LEVEL (mOD)	10.41	**RIG TYPE**	GEO-405
		DATE COMMENCED	11/12/2023
		DATE COMPLETED	11/12/2023
CLIENT	Marina Quarter Limited	**INCLINATION (deg)**	-90
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78
		DRILLED BY	IGSL - AK

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0									SYMMETRIX DRILLING: No recovery, observed by driller as returns of sandy gravelly CLAY				
1		0	0	0									
	1.50												N = 12 (1, 1, 2, 3, 3, 4)
2		0	0	0									
	3.00												N = 49 (7, 8, 12, 11, 14, 12)
3		0	0	0									
4													
	4.50									4.50			
									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY		5.91		N = 50 (5, 9, 14, 9, 10, 17)

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC04**
		SHEET	Sheet 2 of 4
CO-ORDINATES	727,644.28 E 739,271.49 N	**DATE COMMENCED**	11/12/2023
GROUND LEVEL (mOD)	10.41	**DATE COMPLETED**	11/12/2023
RIG TYPE	GEO-405		
INCLINATION (deg)	-90		
CLIENT	Marina Quarter Limited	**DRILLED BY**	IGSL - AK
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
5		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly cobbly CLAY *(continued)*				
	6.00									6.00			
6		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of cobbly CLAY		4.41		N = 84 (4, 12, 27, 19, 18, 20)
7	7.50									7.50			
		0	0	0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY		2.91		N = 71 (6, 6, 11, 19, 21, 20)
8													
		0	0	0									
9	9.00												N = 99 (7, 31, 29, 19, 27, 24)
		0	0	0									

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	RC04
		SHEET	Sheet 3 of 4
CO-ORDINATES	727,644.28 E 739,271.49 N	**DATE COMMENCED**	11/12/2023
GROUND LEVEL (mOD)	10.41	**DATE COMPLETED**	11/12/2023
RIG TYPE	GEO-405		
CLIENT	Marina Quarter Limited		
INCLINATION (deg)	-90	**DRILLED BY**	IGSL - AK
ENGINEER	DOBA	**HOLE DIAMETER (mm)**	78

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing Min Avg Max (mm)	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10									SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY *(continued)*				
	10.50												N = 87 (2, 18, 14, 17, 24, 32)
11		0	0	0									
	12.00												N = 59 (6, 10, 9, 14, 19, 17)
12		0	0	0									
13													
	13.50												N = 65 (5, 9, 11, 16, 18, 20)
14		0	0	0									
	15.00									15.00			

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

End of Borehole at 15.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

OPEN HOLE DRILLING RECORD

REPORT NUMBER 25109

CONTRACT	GLL PRS Holdco. Ltd., Deer Park, Howth	**DRILLHOLE NO**	**RC04**
		SHEET	Sheet 4 of 4
CO-ORDINATES	727,644.28 E 739,271.49 N	**DATE COMMENCED**	11/12/2023
GROUND LEVEL (mOD)	10.41	**DATE COMPLETED**	11/12/2023
RIG TYPE	GEO-405		
INCLINATION (deg)	-90		
CLIENT	Marina Quarter Limited	**DRILLED BY**	IGSL - AK
ENGINEER	DOBA		
HOLE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Zones (m)	Fracture Spacing (Min Avg Max (mm))	Fracture Spacing Log (mm) 0 250 500	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
15											-4.60		N = 65 (9, 11, 12, 15, 19, 19)
16													
17													
18													
19													

REMARKS

Rock and soil descriptions are based on examination of drilling returns. These samples can be heavily disturbed and fragmented, with a loss of fines. Typical fragments of 2 to 3 mm are recovered. Accurate descriptions are not, therefore, possible. Similarly, it is not possible to accurately assess soil stratification or rock condition/structure.

Hole cased from 0.0-15.0m. SPT Er = 61.38%

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-12-23	15.00	1.00	15.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

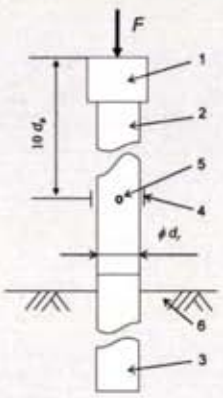
IGSL RC OPEN HOLE 25109.GPJ IGSL.GDT 7/3/24

SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer		SPT Hammer
Test No		EQU2023_53
Client		IGSL
Test Depth (m)		9.70
Mass of hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

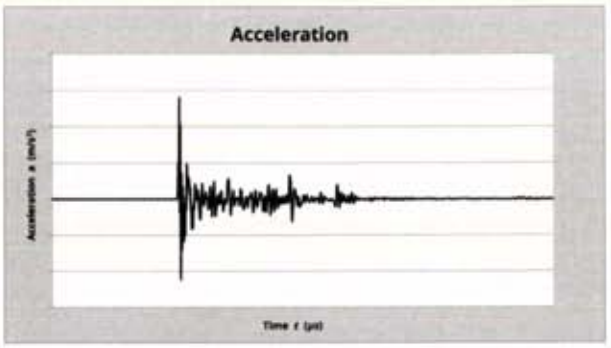
Diameter	d_r =	0.052 m
Length of instrumented rod		0.558 m
Area	A =	11.61 cm²
Modulus	E_a =	206843 MPa

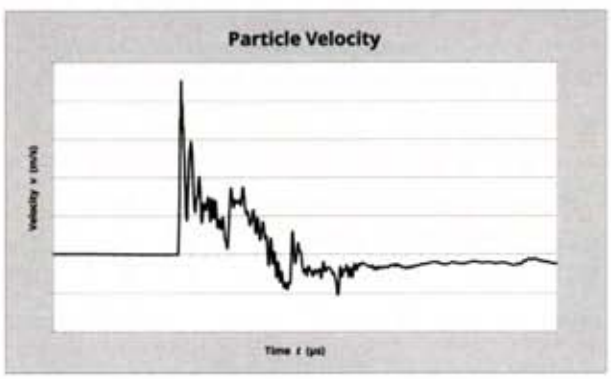
DATE OF TEST	VALID UNTIL	HAMMER ID
06/03/2023	05/03/2024	AR2640

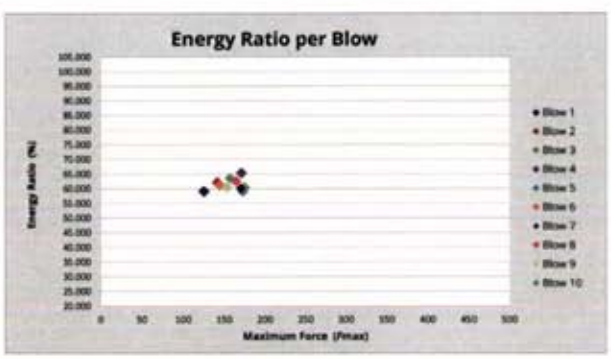
E_{meas} = **0.290** kN-m

E_{theor} = **0.473** kN-m

Comments







Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **61.38%**

Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
JL			10/03/2023

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

Appendix 3

Plate Bearing Test Records

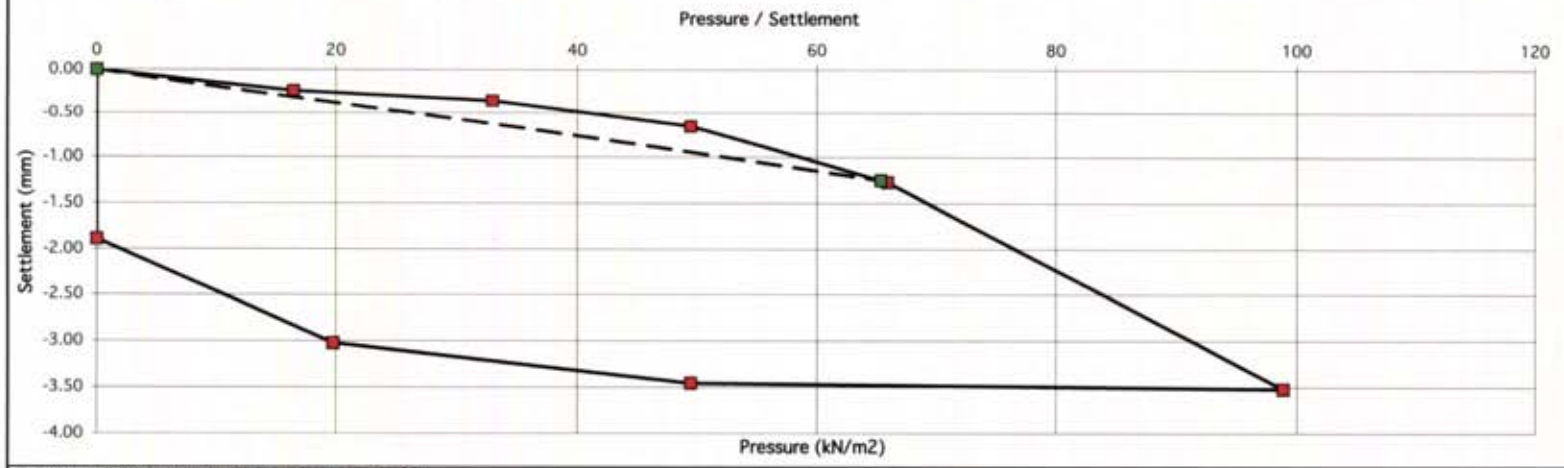
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	25109
Contract	25109 Lands at Deer Park, Howth
Test No.	1 Load
Location	PBT01
Depth	0.45m BGL
Client	Donnachadh O'Brien & Associates
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	C.Quesada
Authorised by	
Date	07/12/2023

Description of soil under test
(natural soil, placed fill, sub-base)
brownish grey gravelly sandy Clay with cobbles.

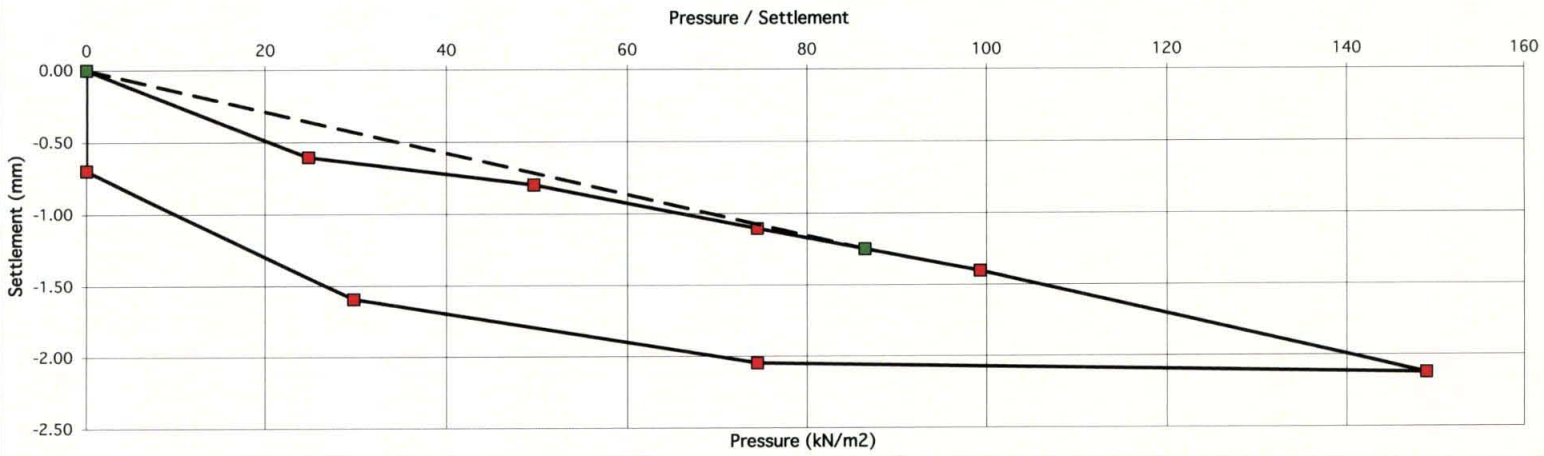
Sample Ref No. _____
Depth _____ m bgl



Gradient at 1.25 mm settlement intersection = 52
Modulus of subgrade reaction = 34 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.3 %

PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve	
Reference No.	25109		
Contract	Lands at Deer Park, Howth	Description of soil under test (natural soil, placed fill, sub-base)	
Test No.	1 Reload	brownish grey gravelly sandy Clasy with cobbles.	
Location	PBT01		
Depth	0.45m BGL		
Client	Donnachadh O'Brien & Associates		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	C.Quesada	Sample Ref No.	
Authorised by		Depth	m bgl
Date	07/12/2023		



Gradient at 1.25 mm settlement intersection = 69
Modulus of subgrade reaction = 44 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.9 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

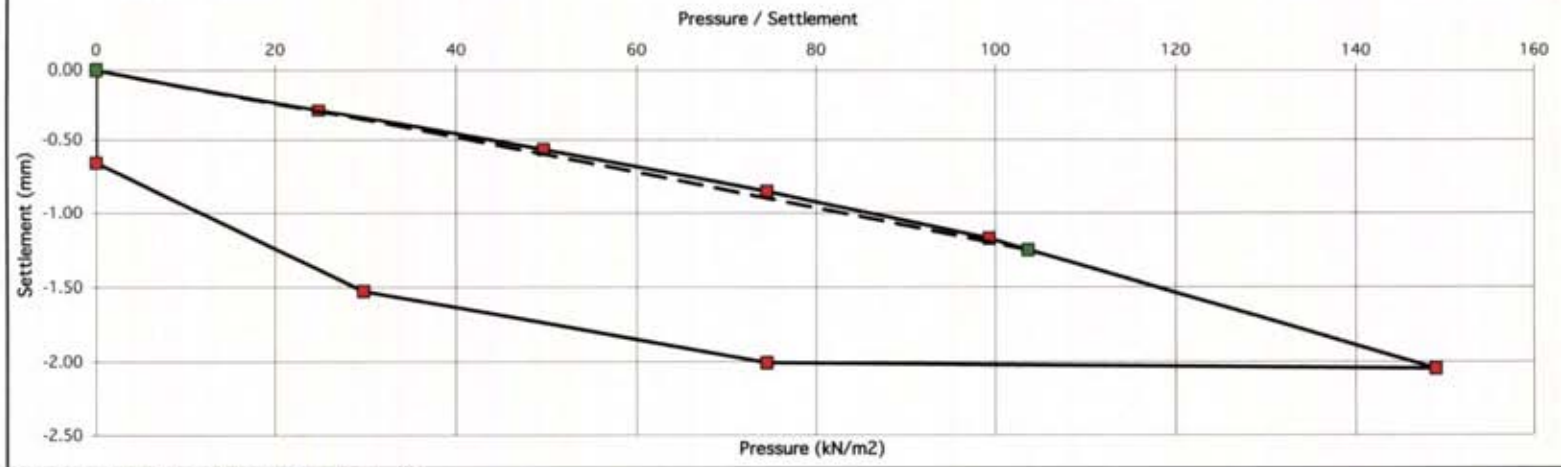
Reference No.	25109
Contract	25109 Lands at Deer Park, Howth
Test No.	2 Load
Location	PBT02
Depth	0.45m BGL
Client	Donnachadh O'Brien & Associates
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	C.Quesada
Authorised by	
Date	07/12/2023

Description of soil under test
(natural soil, placed fill, sub-base)

Brownish grey gravelly clayey Sand

Sample Ref No. _____

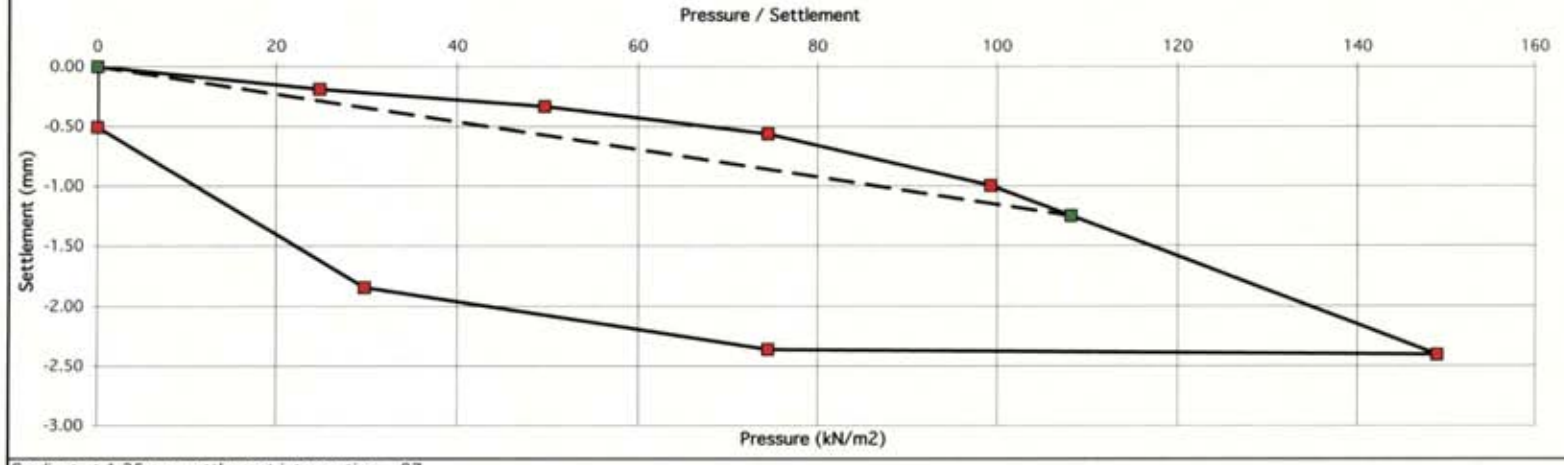
Depth _____ m bgl



Gradient at 1.25 mm settlement intersection = 83
Modulus of subgrade reaction = 53 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 — 9.5 %

PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve	
Reference No.	R152343		
Contract	25109 Lands at Deer Park, Howth	Description of soil under test (natural soil, placed fill, sub-base)	
Test No.	2 Reload	Brownish grey gravelly clayey Sand	
Location	PBT02		
Depth	0.45m BGL		
Client	Donnachadh O'Brien & Associates		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	C.Quesada	Sample Ref No.	
Authorised by		Depth	m bgl
Date	07/12/2023		



Gradient at 1.25 mm settlement intersection = 87
Modulus of subgrade reaction = 56 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 — 10.2 %

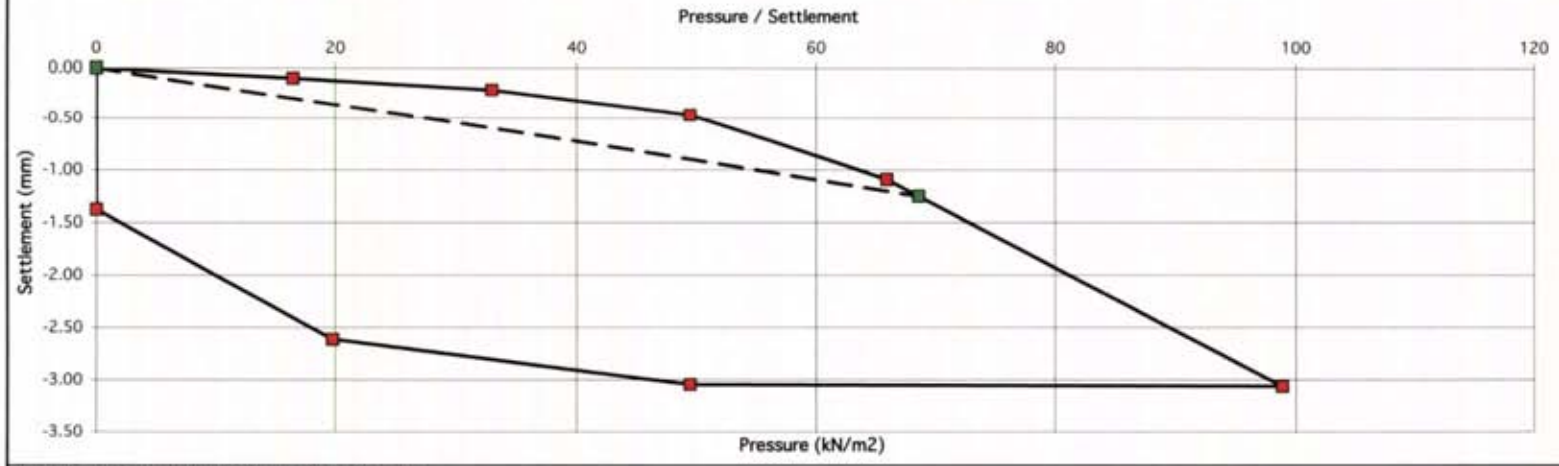
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R152344
Contract	25109 Lands at Deer Park, Howth
Test No.	3 Load
Location	PBT03
Depth	0.45m BGL
Client	Donnachadh O'Brien & Associates
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	C.Quesada
Authorised by	
Date	08/12/2023

Description of soil under test
(natural soil, placed fill, sub-base)
brown gravelly sandy Clay.

Sample Ref No. _____
Depth _____ m bgl



Gradient at 1.25 mm settlement intersection = 55
Modulus of subgrade reaction = 35 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.6 %

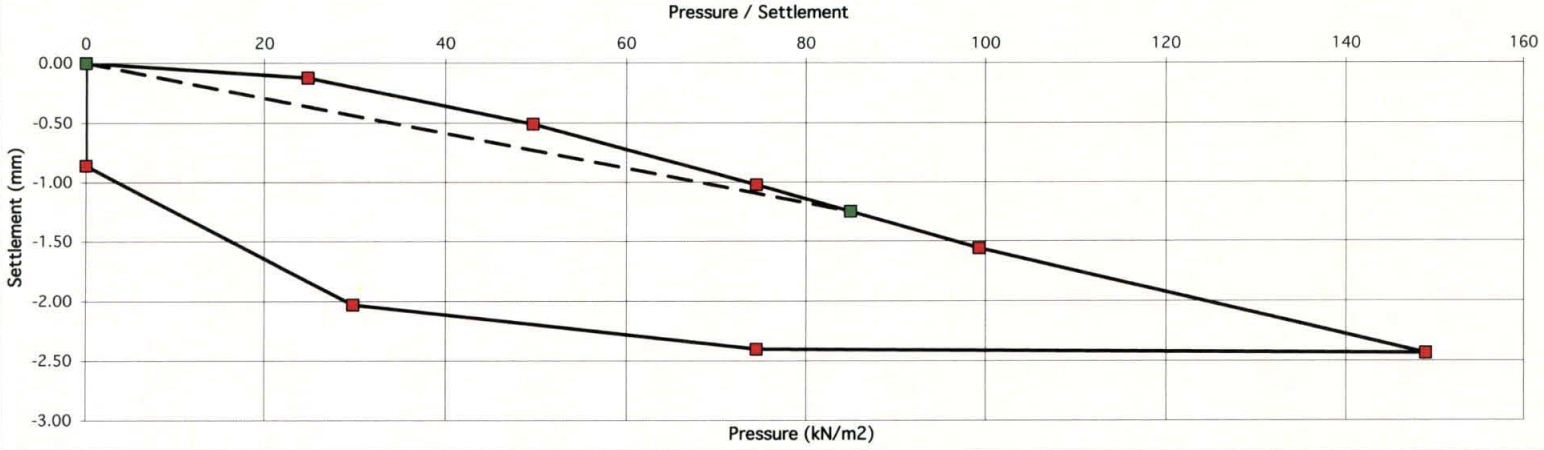
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R152344
Contract	25109 Lands at Deer Park, Howth
Test No.	3 Reload
Location	PBT03
Depth	0.45m BGL
Client	Donnachadh O'Brien & Associates
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	C.Quesada
Authorised by	
Date	08/12/2023

Description of soil under test
(natural soil, placed fill, sub-base)
brown gravelly sandy Clay.

Sample Ref No. _____
Depth _____ m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 68
Modulus of subgrade reaction = 44 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

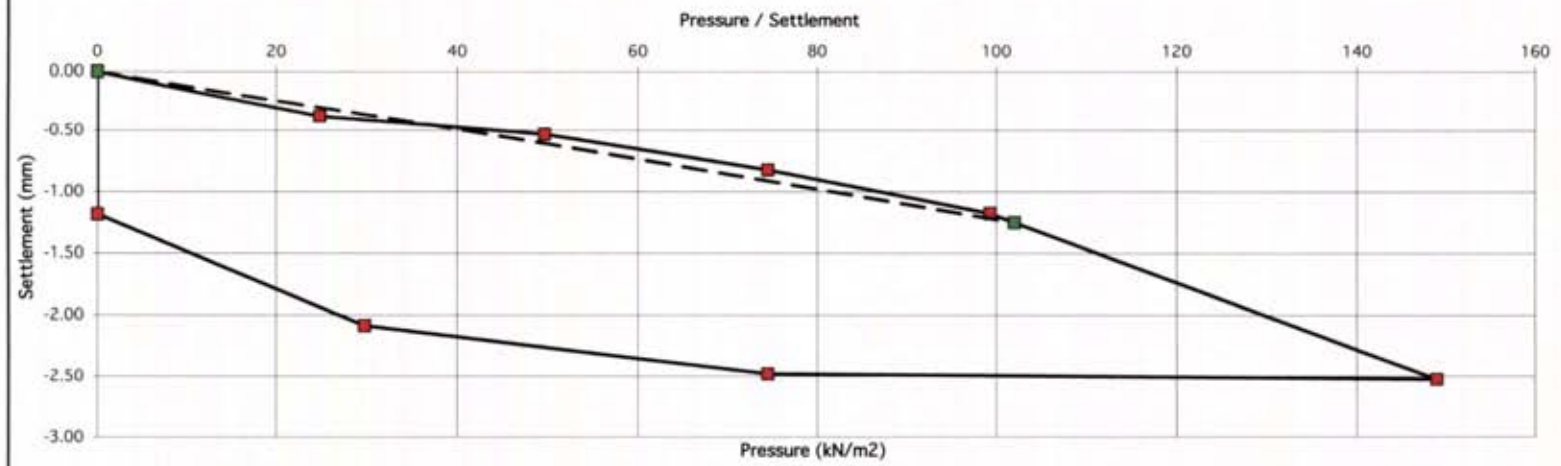
Reference No.	R152345
Contract	25109 Lands at Deer Park, Howth
Test No.	4 Load
Location	PBT04
Depth	0.45m BGL
Client	Donnachadh O'Brien & Associates
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	C.Quesada
Authorised by	
Date	08/12/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brownish grey gravelly sandy Clay with cobbles.

Sample Ref No. _____

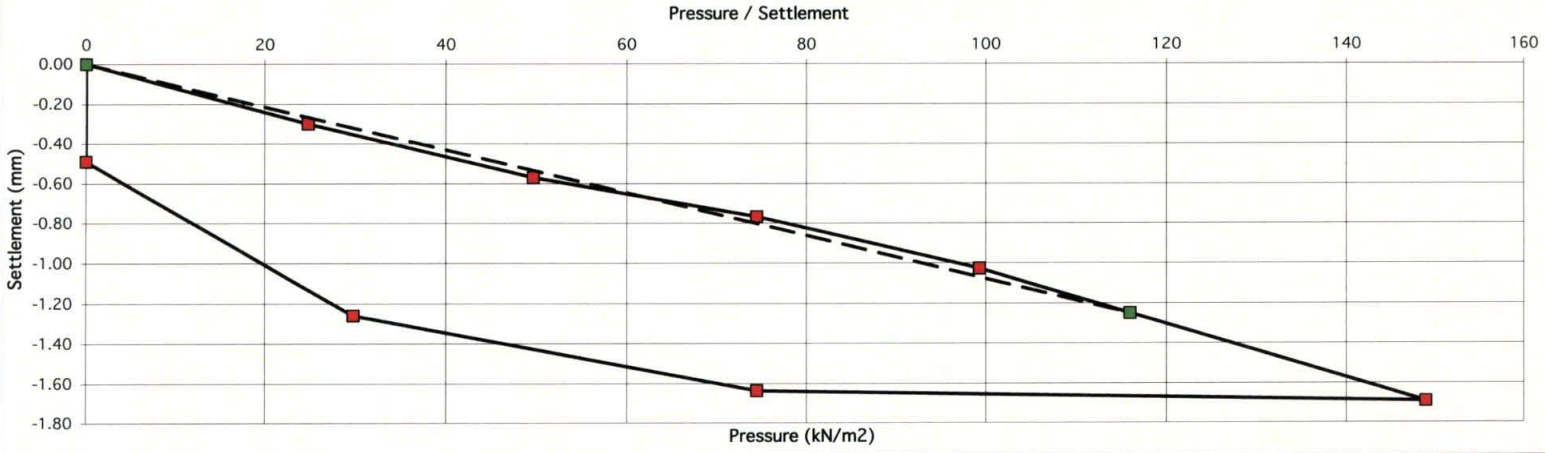
Depth _____ m bgl



Gradient at 1.25 mm settlement intersection = 82
Modulus of subgrade reaction = 52 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 — 9.2 %

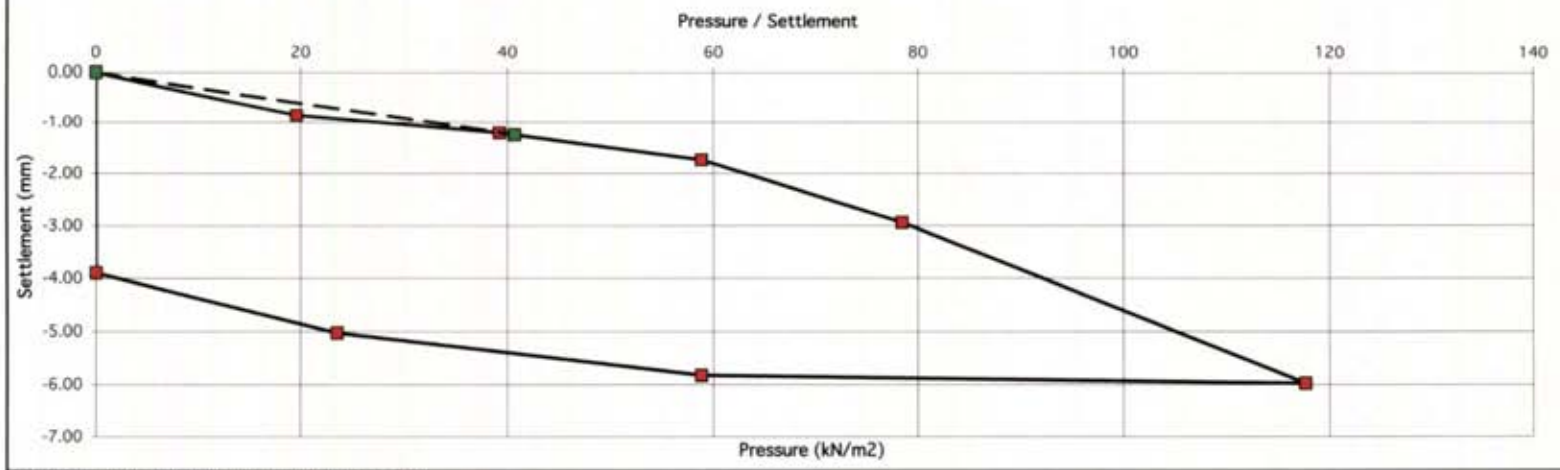
PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve	
Reference No.	R152345		
Contract	25109 Lands at Deer Park, Howth	Description of soil under test (natural soil, placed fill, sub-base)	
Test No.	4 Reload	brownish grey gravelly sandy Clay with cobbles.	
Location	PBT04		
Depth	0.45m BGL		
Client	Donnachadh O'Brien & Associates		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	C.Quesada	Sample Ref No.	
Authorised by		Depth	m bgl
Date	08/12/2023		



Gradient at 1.25 mm settlement intersection = 93
Modulus of subgrade reaction = 60 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 — 11.5 %

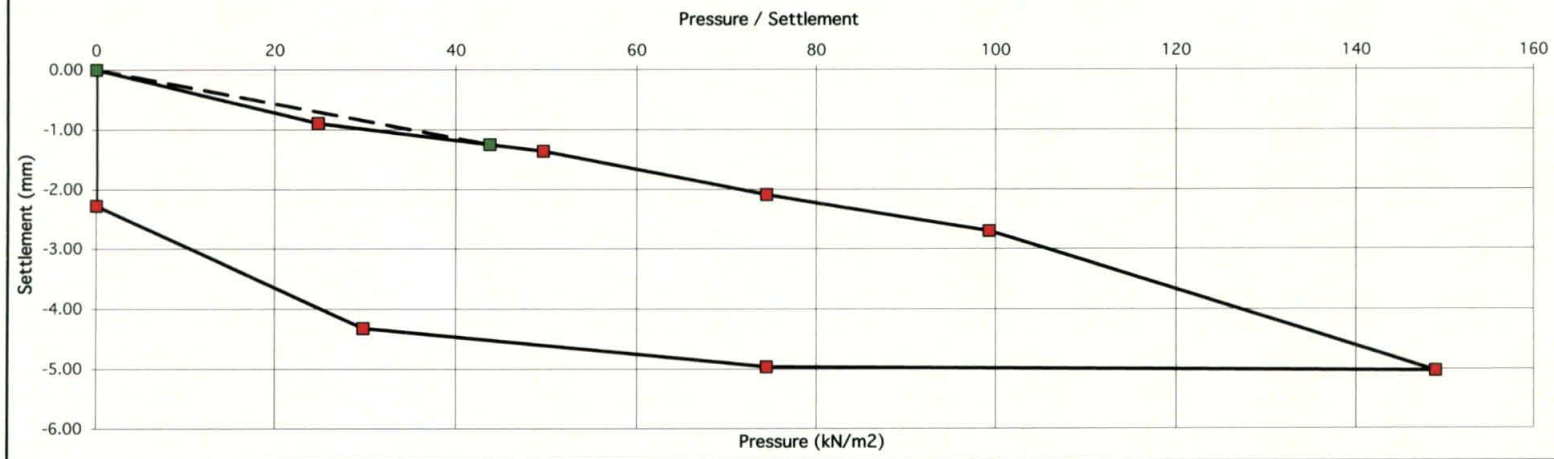
PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve	
Reference No.	R152346		
Contract	25109 Lands at Deer Park, Howth	Description of soil under test (natural soil, placed fill, sub-base)	
Test No.	5 Load	brownish grey gravelly sandy Clay with cobbles.	
Location	PBT05		
Depth	0.45m BGL		
Client	Donnachadh O'Brien & Associates		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	C.Quesada	Sample Ref No.	
Authorised by		Depth	m bgl
Date	08/12/2023		



Gradient at 1.25 mm settlement intersection = 33
Modulus of subgrade reaction = 21 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.9 %

PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve	
Reference No.	R152346		
Contract	25109 Lands at Deer Park, Howth	Description of soil under test (natural soil, placed fill, sub-base)	
Test No.	5 reload	brownish grey gravelly sandy Clay with cobbles.	
Location	PBT05		
Depth	0.45m BGL		
Client	Donnachadh O'Brien & Associates		
Plate Diameter:	450 mm		
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test		
Technician	C.Quesada	Sample Ref No.	
Authorised by		Depth	m bgl
Date	08/12/2023		



Gradient at 1.25 mm settlement intersection = 35
Modulus of subgrade reaction = 22 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.1 %

Appendix 4

Slit Trench Records & Photographs

Report No. 25109	SLIT TRENCH RECORD	FACING DIRECTION: N / W / E / S	IGSL

		Survey				
Project: 25109		Easting (m)	Northing (m)	Elevation (mOD)	Slit Trench No.	1
Engineer: Donnachadh O'Brien & Associates					Sheet	1 of 1
Client:	Start of Trench	727614.763	739266.359	10.614	Date Commenced	08/12/2023
Crew: CQ	End of Trench	727614.022	739270.568	10.51	Date Completed	08/12/2023

Ground Conditions

From (m)	To (m)	Soil Description
0.00	0.20	TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content and frequent rootlets. Sand is fine to coarse.
0.20	0.90	Soft to firm brownish grey gravelly sandy CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded.
0.90	1.20	Firm brown slightly gravelly sandy CLAY with a medium cobble content. Cobbles are subrounded. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded. Frequent grey clayey sand pockets (up to 200mm).

Photograph

Trench Dimensions	
LHS of Trench (m)	0.0
RHS of Trench (m)	3.40
Trench Depth (m)	1.20
Trench Width (m)	1.4

Location

Facing Direction	West
Facing Features	Dublin City
Groundwater	No

SAMPLES

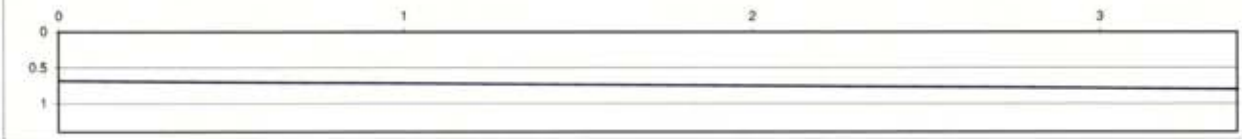
Excavation Quantities

Surface	Length (m)	Material
Road		
Path (LHS)		
Path (RHS)		
Grass Verge (LHS)		
Grass Verge (RHS)	3.4	
Other		
Total Length	3.4	

Zero Metres Taken As:LHS

X-Section

Plan



	Diameter (mm)	Material	Description	Distance (m)	Depth to crown (m)	Angle (deg.)
Service A	90	PVC	GNI Gas Line	0.45	1.05	178
Service B						
Service C						
Service D						
Service E						
Service F						
Service G						
Service H						
Service I						
Service J						
Service K						
Service L						
Service M						

Report No. 25109	SLIT TRENCH RECORD	FACING DIRECTION: N W E S	IGSL

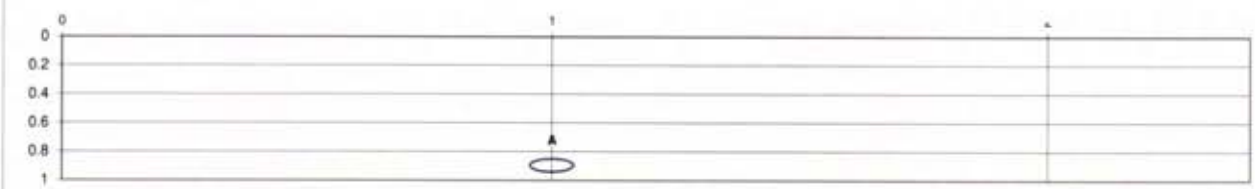
		Survey				
Project: 25109		Easting (m)	Northing (m)	Elevation (mOD)	Slit Trench No.	2
Engineer: Donnachadh O'Brien & Associates					Sheet	1 of 1
Client:	Start of Trench	727596.279	739349.301	6.705	Date Commenced	08/12/2023
Crew: CQ	End of Trench	727596.943	739352.441	6.514	Date Completed	08/12/2023

Ground Conditions

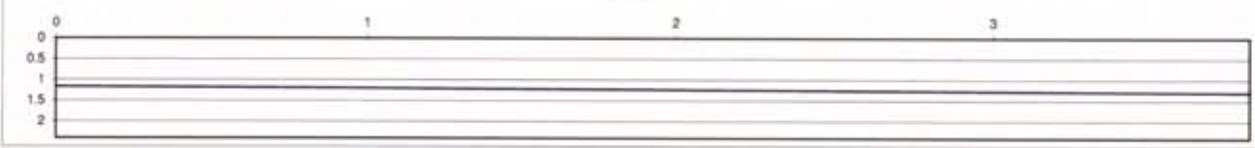
From (m)	To (m)	Soil Description	Photograph
0.00	0.20	TOPSOIL: Soft brown sandy slightly gravelly CLAY with a low cobble content and frequent rootlets and rare fine gravel-sized red ceramic fragments (<2% non-natural material). Sand is fine to coarse.	
0.20	1.00	Soft to firm and firm brown slightly gravelly sandy CLAY with rare subroounded cobble content. Sand is fine to coarse. Gravel is fine to coarse subangular. Occasional yellowish white clayey sand pockets.	

Trench Dimensions		Location	Excavation Quantities		
LHS of Trench (m)	0.0		Surface	Length (m)	Material
RHS of Trench (m)	3.80		Road		
Trench Depth (m)	1.00		Path (LHS)		
Trench Width (m)	2.4		Path (RHS)		
			Grass Verge (LHS)		
			Grass Verge (RHS)	3.8	
Facing Direction	West	SAMPLES	Other		
Facing Features	Dublin City		Total Length	3.8	
Groundwater	No		Zero Metres Taken As: LHS		

X-Section



Plan



	Diameter (mm)	Material	Description	Distance (m)	Depth to crown (m)	Angle (deg.)
Service A	90	PVC	GNI Gas Line	1	0.85	178
Service B						
Service C						
Service D						
Service E						
Service F						
Service G						
Service H						
Service I						
Service J						
Service K						
Service L						
Service M						

ST01 – 1 of 3

ST01 – 2 of 3

ST01 – 3 of 3

ST02 – 1 of 3

ST02 – 2 of 3

ST02 – 3 of 3

Appendix 5

Groundwater Monitoring

Project No.	25109	**GROUNDWATER MONITORING DATA SHEET**	*IGSL Ltd*

Project: GLL PRS Holdco. Ltd., Deer Park Howth - Trial Pit Photographs

Engineer: DOBA

Exploratory Hole No.	Hole Depth m bgl	m OD	Ground Level m OD	Response Zone Top (m bgl)	Response Zone Base (m bgl)	Groundwater Level (m OD) 08/01/2024		Groundwater Level (m bgl)	
RC01	**15.00**	-7.00	8.00	1.00	15.00	**1.65**	6.35		
RC02	**15.00**	-4.68	10.32	1.00	15.00	**1.06**	9.26		
RC03	**15.00**	-5.87	9.13	1.00	15.00	**0.98**	8.15		
RC04	**15.00**	-4.60	10.41	1.00	15.00	**0.81**	9.60		

Notes: Water levels measured using electric dipmeter

RC - denotes rotary drillhole

Appendix 6

Geotechnical Laboratory Results (Soil)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3**

Report No. **R152920** Contract No. 25109 Contract Name: Marina Quarter, Deerpark Howth Dublin

Customer DOBA

Samples Received: 16/12/23 Date Tested: 16/12/23

BH/TP*	Sample No.	Depth* (m)	Lab. Ref	Sample Type*	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP01	AA192494	1.0	A23/5129	B	14	24	NP	NP	69	WS	4.4		Brown sandy gravelly SILT
TP01	AA192495	2.0	A23/5130	B	11	24	14	10	63	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
TP02	AA192497	1.5	A23/5131	B	14	20	NP	NP	74	WS	4.4		Brown sandy gravelly SILT
TP02	AA192498	2.5	A23/5132	B	9.0	27	12	15	63	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY with some cobbles
TP03	AA197453	2.0	A23/5133	B	15	26	15	11	79	WS	4.4	C L	Brown sandy gravelly CLAY
TP03	AA197454	2.3	A23/5134	B	11	26	15	11	66	WS	4.4	C L	Brown sandy, slightly gravelly, CLAY
TP04	AA197456	1.0	A23/5135	B	15	25	13	12	72	WS	4.4	C L	Brown sandy gravelly CLAY
TP04	AA197457	2.0	A23/5136	B	14	24	13	11	73	WS	4.4	C L	Brown sandy, slightly gravelly, CLAY
TP05	AA192492	1.0	A23/5137	B	19	32	16	16	70	WS	4.4	C L	Brown sandy gravelly CLAY
TP05	AA192493	2.0	A23/5138	B	13	28	15	13	64	WS	4.4	C L	Brown sandy, slightly gravelly, CLAY

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results relate only to the specimen tested,in as received condition unless otherwise noted.
NOTE: **These clauses have been superceded by EN 17892-1 and EN17892-12.
Opinions and interpretations are outside the scope of accreditation. * denotes Customer supplied information.
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IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by: H Byrne

Date: 16/01/24

Page: 1 of 1

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	91	
14	87	
10	84	
6.3	79	
5	77	
3.35	72	
2	68	
1.18	64	SAND
0.6	59	
0.425	57	
0.3	53	
0.15	44	
0.063	37	SILT/CLAY
0.038	30	
0.027	27	
0.017	23	
0.010	20	
0.007	18	
0.005	15	
0.002	11	

Contract No. 25109 Report No. R152915

Contract Name : Marina Quarter Deerpark Howth Dublin

BH/TP No. TP01

Sample No.* AA192495 Lab. Sample No. A23/5130

Sample Type: B

Depth* (m) 2.00 Customer: DOBA

Date Received 16/12/2024 Date Testing started 16/12/2024

Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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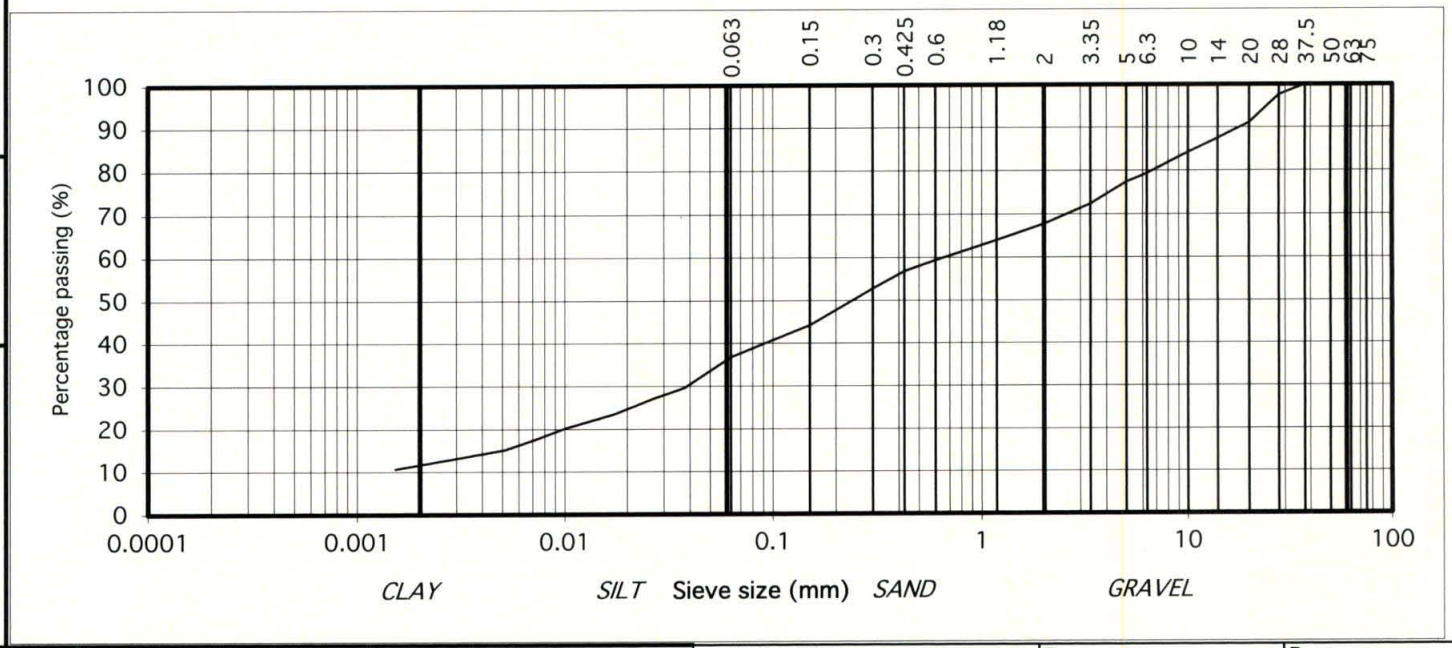

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Approved by:	Date:	Page no:
H Byrne	16/01/24	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

particle size	% passing	
75	83	COBBLES
63	83	
50	83	GRAVEL
37.5	80	
28	78	
20	75	
14	72	
10	70	
6.3	67	
5	65	
3.35	63	
2	60	
1.18	58	SAND
0.6	55	
0.425	53	
0.3	51	
0.15	43	
0.063	33	SILT/CLAY
0.038	27	
0.027	24	
0.017	21	
0.010	18	
0.007	16	
0.005	14	
0.002	11	

Contract No.	25109	Report No.	R152916
Contract Name :	Marina Quarter Deerpark Howth Dublin		
BH/TP No.	TP02		
Sample No.*	AA192498	Lab. Sample No.	A23/5132
Sample Type:	B		
Depth* (m)	2.50	Customer:	DOBA
Date Received	16/12/2024	Date Testing started	16/12/2024
Description:	Brown slightly sandy, slightly gravelly, CLAY with some cobbles		
Remarks	Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377		

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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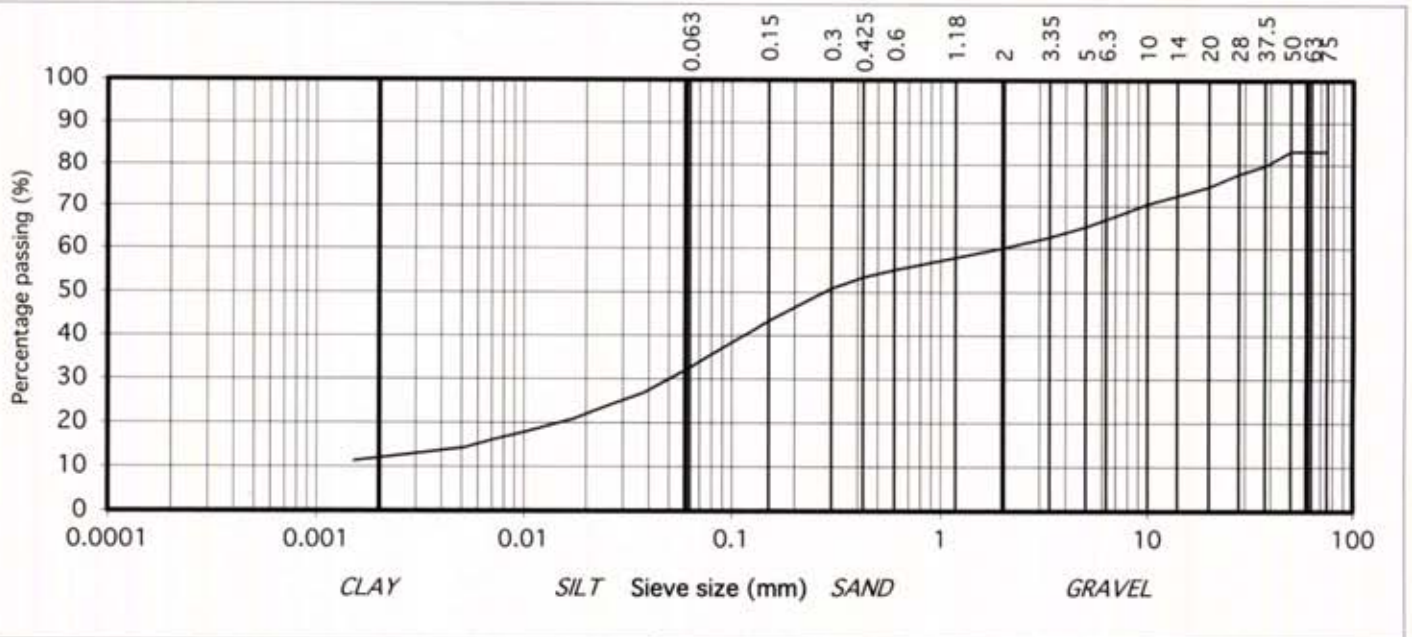


IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	H Byrne	16/01/24	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

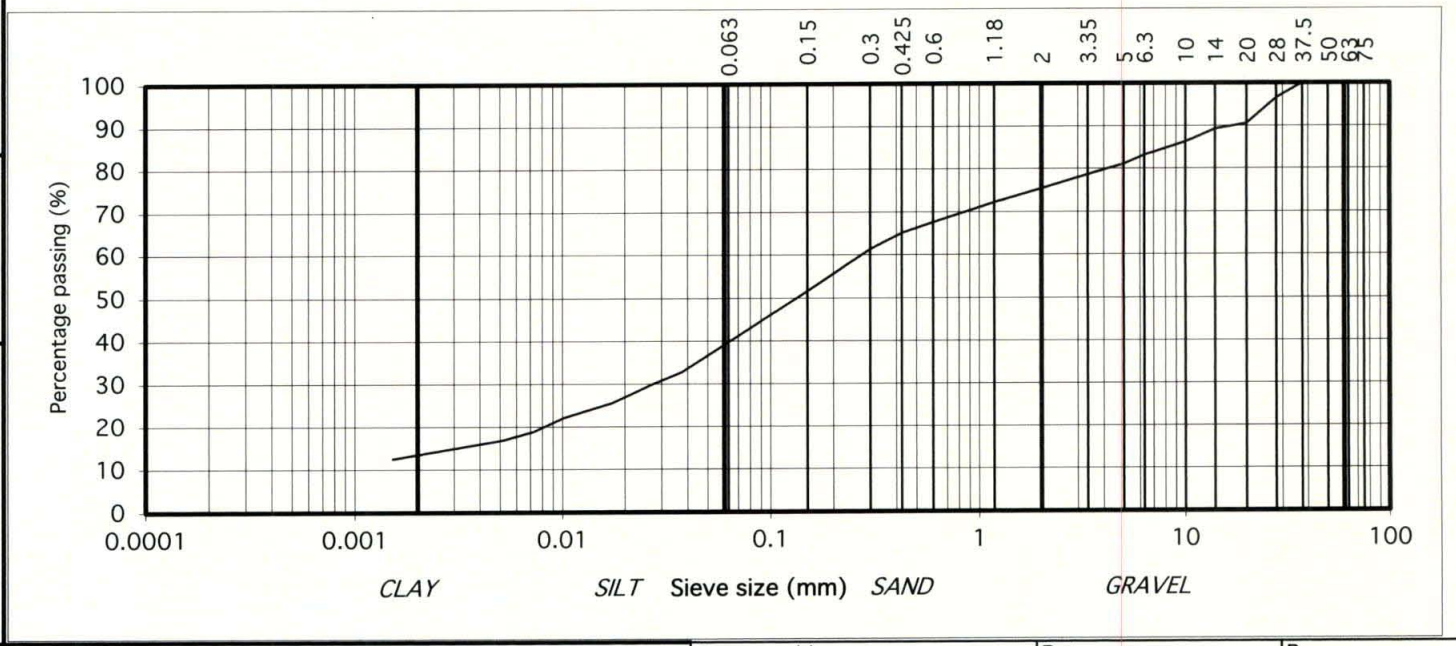
ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	97	
20	90	
14	89	
10	86	
6.3	83	
5	81	
3.35	79	
2	75	
1.18	72	SAND
0.6	68	
0.425	65	
0.3	61	
0.15	52	
0.063	40	SILT/CLAY
0.038	33	
0.027	30	
0.017	26	
0.010	22	
0.007	19	
0.005	17	
0.002	12	

Contract No.	25109	Report No.	R152917	
Contract Name :	Marina Quarter Deerpark Howth Dublin			
BH/TP No.	TP03			
Sample No.*	AA197454	Lab. Sample No.		A23/5134
Sample Type:	B			
Depth* (m)	2.30	Customer:	DOBA	
Date Received	16/12/2024	Date Testing started		16/12/2024
Description:	Brown sandy, slightly gravelly, CLAY			

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

Remarks: Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	99	
14	98	
10	96	
6.3	93	
5	91	
3.35	89	
2	85	
1.18	81	SAND
0.6	75	
0.425	72	
0.3	68	
0.15	57	
0.063	45	SILT/CLAY
0.038	37	
0.027	33	
0.017	28	
0.010	25	
0.007	22	
0.005	19	
0.002	14	

Contract No.	25109	Report No.	R152918
Contract Name :	Marina Quarter Deerpark Howth Dublin		
BH/TP No.	TP04		
Sample No.*	AA197457	Lab. Sample No.	A23/5136
Sample Type:	B		
Depth* (m)	2.00	Customer:	DOBA
Date Received	16/12/2024	Date Testing started	16/12/2024
Description:	Brown sandy, slightly gravelly, CLAY		

Remarks

Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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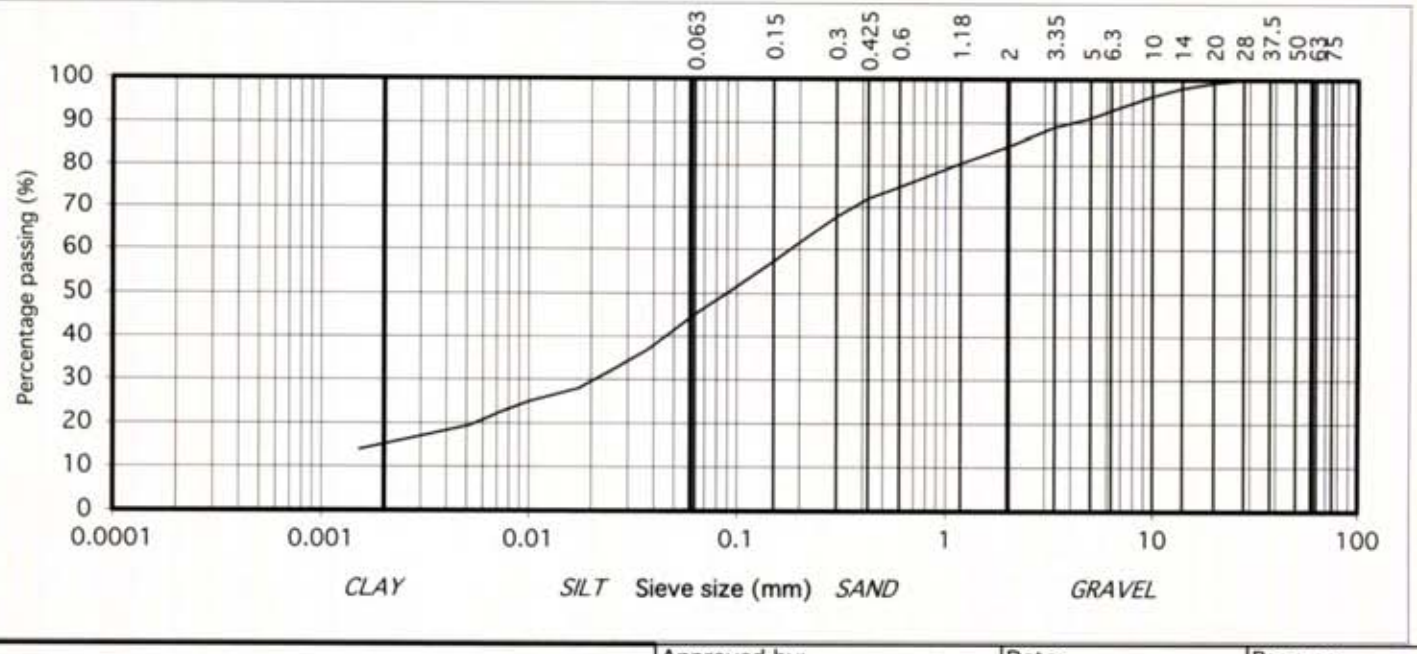

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT

Determination of Particle Size Distribution

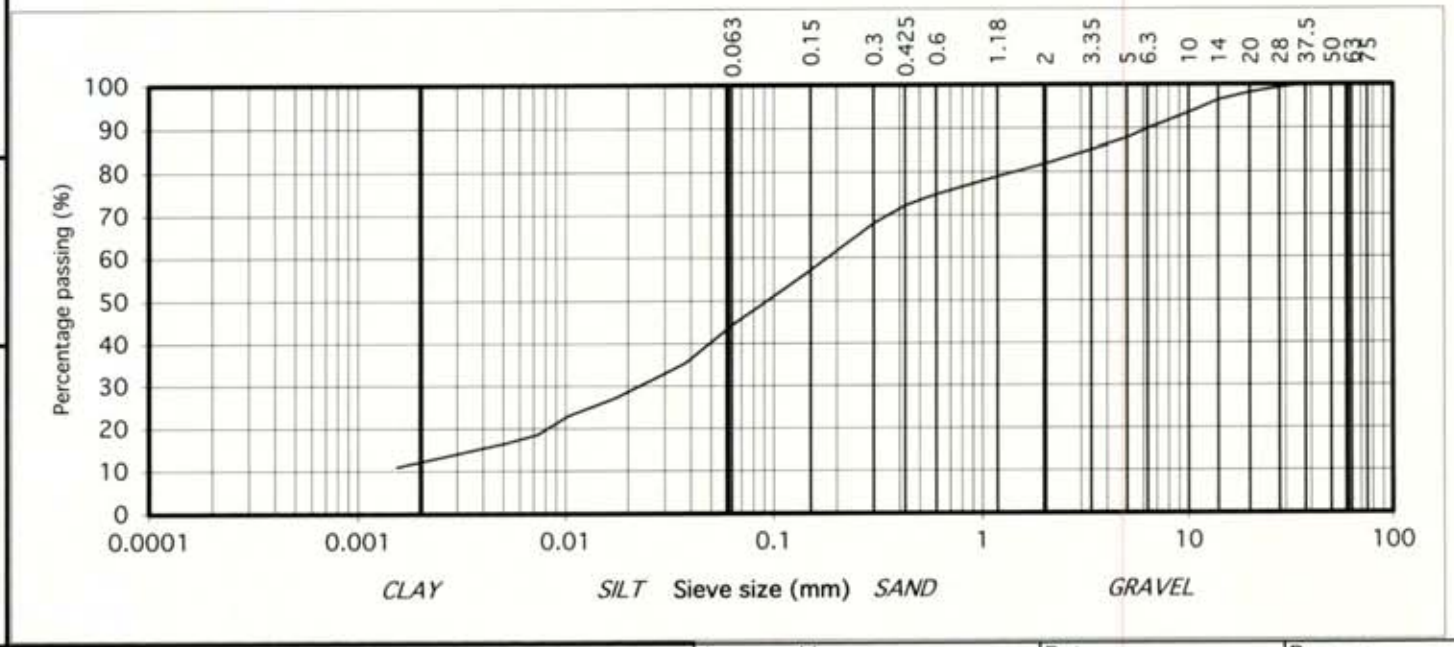
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	99	
20	98	
14	96	
10	93	
6.3	90	
5	88	
3.35	85	
2	82	
1.18	79	SAND
0.6	75	
0.425	72	
0.3	68	
0.15	57	
0.063	44	SILT/CLAY
0.038	36	
0.027	32	
0.017	27	
0.010	23	
0.007	19	
0.005	17	
0.002	11	

Contract No.	25109	Report No.	R152919	
Contract Name :	Marina Quarter Deerpark Howth Dublin			
BH/TP No.	TP05			
Sample No.*	AA197493	Lab. Sample No.		A23/5138
Sample Type:	B			
Depth* (m)	2.00	Customer:	DOBA	
Date Received	16/12/2024	Date Testing started		16/12/2024
Description:	Brown sandy, slightly gravelly, CLAY			
Remarks	Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377			

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

Appendix 7

Geo-Environmental & Chemical Laboratory Results (Soils)

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

mCERTS

Final Report

Report No.:	23-42036-1
Initial Date of Issue:	08-Jan-2024
Re-Issue Details:	
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	25109 Marina Quater
Quotation No.:	Q20-21693
Date Received:	19-Dec-2023
Order No.:	
Date Instructed:	19-Dec-2023
No. of Samples:	10
Turnaround (Wkdays):	7
Results Due:	04-Jan-2024
Date Approved:	08-Jan-2024
Approved By:	
Details:	Stuart Henderson, Technical Manager

Results - Leachate

Project: 25109 Marina Quater

Client: IGSL				**Chemtest Job No.:**		23-42036	23-42036	23-42036	23-42036	23-42036
Quotation No.: Q20-21693				**Chemtest Sample ID.:**		1747971	1747974	1747975	1747978	1747979
Order No.:				Client Sample Ref.:		AA192494	AA192497	AA197452	AA197456	AA192492
				Sample Location:		TP01	TP02	TP03	TP04	TP05
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.00	1.50	1.00	1.00	1.00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**					
Ammonium	U	1220	10:1	mg/l	0.050	0.49	0.44	0.68	0.65	0.47
Ammonium	N	1220	10:1	mg/kg	0.10	8.6	8.3	12	11	7.2

Results - Soil

Project: 25109 Marina Quater

Client: IGSL			Chemtest Job No.:			23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036
Quotation No.: Q20-21693			Chemtest Sample ID.:			1747971	1747972	1747973	1747974	1747975	1747976	1747977	1747978
Order No.:			Client Sample Ref.:			AA192494	AA192495	AA192496	AA192497	AA197452	AA197453	AA197455	AA197456
			Sample Location:			TP01	TP01	TP02	TP02	TP03	TP03	TP04	TP04
			Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):			1.00	2.00	0.20	1.50	1.00	2.00	0.20	1.00
			Asbestos Lab:			DURHAM			DURHAM	DURHAM			DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type		U	2192		N/A	-			-	-			-
Asbestos Identification		U	2192		N/A	No Asbestos Detected			No Asbestos Detected	No Asbestos Detected			No Asbestos Detected
Moisture		N	2030	%	0.020	12	9.1	9.9	11	13	11	9.1	11
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones and Roots	Stones	Stones	Stones	Stones	Stones
Soil Texture		N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
pH at 20C		M	2010		4.0	[A] 8.8			[A] 9.0	[A] 8.8			[A] 8.9
pH (2.5:1) at 20C		N	2010		4.0		[A] 8.8	[A] 8.9			[A] 8.9	[A] 8.9	
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	[A] < 0.40			[A] < 0.40	[A] < 0.40			[A] < 0.40
Magnesium (Water Soluble)		N	2120	g/l	0.010		[A] < 0.010	[A] < 0.010			[A] < 0.010	[A] < 0.010	
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010		[A] < 0.010	[A] < 0.010			[A] < 0.010	[A] < 0.010	
Total Sulphur		U	2175	%	0.010		[A] 0.012	[A] 0.018			[A] 0.012	[A] 0.013	
Sulphur (Elemental)		M	2180	mg/kg	1.0	[A] 1.5			[A] 2.3	[A] 1.7			[A] 1.8
Chloride (Water Soluble)		M	2220	g/l	0.010		[A] 0.16	[A] < 0.010			[A] < 0.010	[A] < 0.010	
Nitrate (Water Soluble)		N	2220	g/l	0.010		< 0.010	< 0.010			< 0.010	< 0.010	
Cyanide (Total)		M	2300	mg/kg	0.50	[A] < 0.50			[A] < 0.50	[A] < 0.50			[A] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	[A] 4.6			[A] 4.3	[A] 5.0			[A] 5.1
Ammonium (Water Soluble)		M	2220	g/l	0.01		< 0.01	< 0.01			< 0.01	< 0.01	
Sulphate (Total)		U	2430	%	0.010	[A] 0.039			[A] 0.059	[A] 0.031			[A] 0.052
Sulphate (Acid Soluble)		U	2430	%	0.010		[A] 0.027	[A] 0.043			[A] 0.020	[A] 0.036	
Arsenic		M	2455	mg/kg	0.5	15			15	18			13
Barium		M	2455	mg/kg	0	100			81	92			96
Cadmium		M	2455	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Chromium		M	2455	mg/kg	0.5	38			22	37			36
Molybdenum		M	2455	mg/kg	0.5	< 0.5			< 0.5	< 0.5			< 0.5
Antimony		N	2455	mg/kg	2.0	< 2.0			< 2.0	< 2.0			< 2.0
Copper		M	2455	mg/kg	0.50	33			34	35			34
Mercury		M	2455	mg/kg	0.05	0.05			0.05	0.05			0.05
Nickel		M	2455	mg/kg	0.50	58			49	62			54
Lead		M	2455	mg/kg	0.50	21			20	21			20
Selenium		M	2455	mg/kg	0.25	< 0.25			< 0.25	< 0.25			< 0.25
Zinc		M	2455	mg/kg	0.50	90			99	78			87
Chromium (Trivalent)		N	2490	mg/kg	1.0	38			22	37			36
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50			< 0.50	< 0.50			< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05

Results - Soil

Project: 25109 Marina Quater

Client: IGSL				Chemtest Job No.:		23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036
Quotation No.: Q20-21693				Chemtest Sample ID.:		1747971	1747972	1747973	1747974	1747975	1747976	1747977	1747978
Order No.:				Client Sample Ref.:		AA192494	AA192495	AA192496	AA192497	AA197452	AA197453	AA197455	AA197456
				Sample Location:		TP01	TP01	TP02	TP02	TP03	TP03	TP04	TP04
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.00	2.00	0.20	1.50	1.00	2.00	0.20	1.00
				Asbestos Lab:		DURHAM			DURHAM	DURHAM			DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[A] < 0.25			[A] < 0.25	[A] < 0.25			[A] < 0.25
Aliphatic EPH >C10-C12	EH_2D_AL_#1	M	2690	mg/kg	2.00	[A] 2.2			[A] < 2.0	[A] < 2.0			[A] < 2.0
Aliphatic EPH >C12-C16	EH_2D_AL_#1	M	2690	mg/kg	1.00	[A] 4.0			[A] 2.0	[A] 1.5			[A] 3.3
Aliphatic EPH >C16-C21	EH_2D_AL_#1	M	2690	mg/kg	2.00	[A] 2.6			[A] < 2.0	[A] < 2.0			[A] 2.4
Aliphatic EPH >C21-C35	EH_2D_AL_#1	M	2690	mg/kg	3.00	[A] < 3.0			[A] < 3.0	[A] < 3.0			[A] < 3.0
Aliphatic EPH >C35-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	[A] < 10			[A] < 10	[A] < 10			[A] < 10
Total Aliphatic EPH >C10-C35	EH_2D_AL_#1	M	2690	mg/kg	5.00	[A] 11			[A] < 5.0	[A] < 5.0			[A] 8.9
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[A] < 0.25			[A] < 0.25	[A] < 0.25			[A] < 0.25
Aromatic EPH >C10-C12	EH_2D_AR_#1	U	2690	mg/kg	1.00	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Aromatic EPH >C12-C16	EH_2D_AR_#1	U	2690	mg/kg	1.00	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Aromatic EPH >C16-C21	EH_2D_AR_#1	U	2690	mg/kg	2.00	[A] 8.0			[A] 9.4	[A] 5.8			[A] 9.3
Aromatic EPH >C21-C35	EH_2D_AR_#1	U	2690	mg/kg	2.00	[A] 2.4			[A] < 2.0	[A] < 2.0			[A] < 2.0
Aromatic EPH >C35-C40	EH_2D_AR_#1	N	2690	mg/kg	1.00	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Total Aromatic EPH >C10-C35	EH_2D_AR_#1	U	2690	mg/kg	5.00	[A] 10			[A] 10	[A] 6.7			[A] 11
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[A] < 0.50			[A] < 0.50	[A] < 0.50			[A] < 0.50
Total EPH >C10-C35	EH_2D_Total_#1	U	2690	mg/kg	10.00	[A] 22			[A] 15	[A] 11			[A] 20
Total Organic Carbon		M	2625	%	0.20	[A] < 0.20			[A] 0.89	[A] 0.83			[A] 0.24
Mineral Oil EPH	EH_2D_AL_#1	N	2670	mg/kg	10	11			< 10	< 10			< 10
Benzene		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Toluene		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Ethylbenzene		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[A] < 1.0			[A] < 1.0	[A] < 1.0			[A] < 1.0
Naphthalene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Fluorene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Phenanthrene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Anthracene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Fluoranthene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Pyrene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Benzo[a]anthracene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10
Chrysene		M	2800	mg/kg	0.10	< 0.10			< 0.10	< 0.10			< 0.10

Results - Soil

Project: 25109 Marina Quater

Client: IGSL						**Chemtest Job No.:**	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036	23-42036
Quotation No.: Q20-21693						**Chemtest Sample ID.:**	1747971	1747972	1747973	1747974	1747975	1747976	1747977	1747978
Order No.:						Client Sample Ref.:	AA192494	AA192495	AA192496	AA192497	AA197452	AA197453	AA197455	AA197456
						Sample Location:	TP01	TP01	TP02	TP02	TP03	TP03	TP04	TP04
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	1.00	2.00	0.20	1.50	1.00	2.00	0.20	1.00
						Asbestos Lab:	DURHAM			DURHAM	DURHAM			DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**									
Benzo[b]fluoranthene		M	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Benzo[k]fluoranthene		M	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Benzo[a]pyrene		M	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Coronene		N	2800	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10
Total Of 17 PAH's Lower		N	2800	mg/kg	1.0		< 1.0			< 1.0	< 1.0			< 1.0
PCB 28		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 52		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 101		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 118		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 153		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 138		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
PCB 180		U	2815	mg/kg	0.010		[A] < 0.010			[A] < 0.010	[A] < 0.010			[A] < 0.010
Tot PCBs Low (7 Congeners)		N	2815	mg/kg	0.05		[A] < 0.05			[A] < 0.05	[A] < 0.05			[A] < 0.05
Total Phenols		M	2920	mg/kg	0.10		< 0.10			< 0.10	< 0.10			< 0.10

Results - Soil

Project: 25109 Marina Quater

Client: IGSL				**Chemtest Job No.:**		23-42036	23-42036
Quotation No.: Q20-21693				**Chemtest Sample ID.:**		1747979	1747980
Order No.:				Client Sample Ref.:		AA192492	AA192493
				Sample Location:		TP05	TP05
				Sample Type:		SOIL	SOIL
				Top Depth (m):		1.00	2.00
				Asbestos Lab:		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type		U	2192		N/A	-	
Asbestos Identification		U	2192		N/A	No Asbestos Detected	
Moisture		N	2030	%	0.020	13	11
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones
Soil Texture		N	2040		N/A	Clay	Clay
pH at 20C		M	2010		4.0	[A] 8.7	
pH (2.5:1) at 20C		N	2010		4.0		[A] 8.7
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	[A] < 0.40	
Magnesium (Water Soluble)		N	2120	g/l	0.010		[A] < 0.010
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010		[A] < 0.010
Total Sulphur		U	2175	%	0.010		[A] 0.014
Sulphur (Elemental)		M	2180	mg/kg	1.0	[A] 1.8	
Chloride (Water Soluble)		M	2220	g/l	0.010		[A] < 0.010
Nitrate (Water Soluble)		N	2220	g/l	0.010		< 0.010
Cyanide (Total)		M	2300	mg/kg	0.50	[A] < 0.50	
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	[A] 4.7	
Ammonium (Water Soluble)		M	2220	g/l	0.01		< 0.01
Sulphate (Total)		U	2430	%	0.010	[A] 0.054	
Sulphate (Acid Soluble)		U	2430	%	0.010		[A] 0.050
Arsenic		M	2455	mg/kg	0.5	15	
Barium		M	2455	mg/kg	0	87	
Cadmium		M	2455	mg/kg	0.10	< 0.10	
Chromium		M	2455	mg/kg	0.5	40	
Molybdenum		M	2455	mg/kg	0.5	< 0.5	
Antimony		N	2455	mg/kg	2.0	< 2.0	
Copper		M	2455	mg/kg	0.50	34	
Mercury		M	2455	mg/kg	0.05	0.07	
Nickel		M	2455	mg/kg	0.50	59	
Lead		M	2455	mg/kg	0.50	25	
Selenium		M	2455	mg/kg	0.25	< 0.25	
Zinc		M	2455	mg/kg	0.50	88	
Chromium (Trivalent)		N	2490	mg/kg	1.0	40	
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05	
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05	
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05	

Results - Soil

Project: 25109 Marina Quater

Client: IGSL			**Chemtest Job No.:**			23-42036	23-42036
Quotation No.: Q20-21693			**Chemtest Sample ID.:**			1747979	1747980
Order No.:			Client Sample Ref.:			AA192492	AA192493
			Sample Location:			TP05	TP05
			Sample Type:			SOIL	SOIL
			Top Depth (m):			1.00	2.00
			Asbestos Lab:			DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[A] < 0.05	
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[A] < 0.25	
Aliphatic EPH >C10-C12	EH_2D_AL_#1	M	2690	mg/kg	2.00	[A] < 2.0	
Aliphatic EPH >C12-C16	EH_2D_AL_#1	M	2690	mg/kg	1.00	[A] < 1.0	
Aliphatic EPH >C16-C21	EH_2D_AL_#1	M	2690	mg/kg	2.00	[A] < 2.0	
Aliphatic EPH >C21-C35	EH_2D_AL_#1	M	2690	mg/kg	3.00	[A] < 3.0	
Aliphatic EPH >C35-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	[A] < 10	
Total Aliphatic EPH >C10-C35	EH_2D_AL_#1	M	2690	mg/kg	5.00	[A] < 5.0	
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05	
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05	
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[A] < 0.05	
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[A] < 0.25	
Aromatic EPH >C10-C12	EH_2D_AR_#1	U	2690	mg/kg	1.00	[A] < 1.0	
Aromatic EPH >C12-C16	EH_2D_AR_#1	U	2690	mg/kg	1.00	[A] < 1.0	
Aromatic EPH >C16-C21	EH_2D_AR_#1	U	2690	mg/kg	2.00	[A] 3.4	
Aromatic EPH >C21-C35	EH_2D_AR_#1	U	2690	mg/kg	2.00	[A] < 2.0	
Aromatic EPH >C35-C40	EH_2D_AR_#1	N	2690	mg/kg	1.00	[A] < 1.0	
Total Aromatic EPH >C10-C35	EH_2D_AR_#1	U	2690	mg/kg	5.00	[A] < 5.0	
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[A] < 0.50	
Total EPH >C10-C35	EH_2D_Total_#1	U	2690	mg/kg	10.00	[A] < 10	
Total Organic Carbon		M	2625	%	0.20	[A] 0.42	
Mineral Oil EPH	EH_2D_AL_#1	N	2670	mg/kg	10	< 10	
Benzene		M	2760	µg/kg	1.0	[A] < 1.0	
Toluene		M	2760	µg/kg	1.0	[A] < 1.0	
Ethylbenzene		M	2760	µg/kg	1.0	[A] < 1.0	
m & p-Xylene		M	2760	µg/kg	1.0	[A] < 1.0	
o-Xylene		M	2760	µg/kg	1.0	[A] < 1.0	
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[A] < 1.0	
Naphthalene		M	2800	mg/kg	0.10	< 0.10	
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	
Fluorene		M	2800	mg/kg	0.10	< 0.10	
Phenanthrene		M	2800	mg/kg	0.10	< 0.10	
Anthracene		M	2800	mg/kg	0.10	< 0.10	
Fluoranthene		M	2800	mg/kg	0.10	< 0.10	
Pyrene		M	2800	mg/kg	0.10	< 0.10	
Benzo[a]anthracene		M	2800	mg/kg	0.10	< 0.10	
Chrysene		M	2800	mg/kg	0.10	< 0.10	

Results - Soil

Project: 25109 Marina Quater

Client: IGSL				**Chemtest Job No.:**		23-42036	23-42036
Quotation No.: Q20-21693				**Chemtest Sample ID.:**		1747979	1747980
Order No.:				Client Sample Ref.:		AA192492	AA192493
				Sample Location:		TP05	TP05
				Sample Type:		SOIL	SOIL
				Top Depth (m):		1.00	2.00
				Asbestos Lab:		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	< 0.10	
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	< 0.10	
Benzo[a]pyrene		M	2800	mg/kg	0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	< 0.10	
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10	
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	< 0.10	
Coronene		N	2800	mg/kg	0.10	< 0.10	
Total Of 17 PAH's Lower		N	2800	mg/kg	1.0	< 1.0	
PCB 28		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 52		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 101		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 118		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 153		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 138		U	2815	mg/kg	0.010	[A] < 0.010	
PCB 180		U	2815	mg/kg	0.010	[A] < 0.010	
Tot PCBs Low (7 Congeners)		N	2815	mg/kg	0.05	[A] < 0.05	
Total Phenols		M	2920	mg/kg	0.10	< 0.10	

Results - Single Stage WAC

Project: 25109 Marina Quater

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-42036							
Chemtest Sample ID:	1747971							
Sample Ref:	AA192494							
Sample ID:								
Sample Location:	TP01							
Top Depth(m):	1.00							
Bottom Depth(m):								
Sampling Date:								
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		M	%	[A] < 0.20	3	5	6
Loss On Ignition	2610		M	%	7.1	--	--	10
Total BTEX	2760		M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_1D_Total_CU	M	mg/kg	[A] < 10	500	--	--
Total (of 17) PAHs						100	--	--
pH at 20C	2010		M		8.8	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.0060	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0004	0.0038	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0006	0.0061	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0003	0.0035	0.5	10	30
Nickel	1455		U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.011	0.11	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.12	1.2	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	29	290	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	6.5	65	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 25109 Marina Quater

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-42036							
Chemtest Sample ID:	1747974							
Sample Ref:	AA192497							
Sample ID:								
Sample Location:	TP02							
Top Depth(m):	1.50							
Bottom Depth(m):								
Sampling Date:								
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		M	%	[A] 0.89	3	5	6
Loss On Ignition	2610		M	%	1.7	--	--	10
Total BTEX	2760		M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_1D_Total_CU	M	mg/kg	[A] < 10	500	--	--
Total (of 17) PAHs						100	--	--
pH at 20C	2010		M		9.0	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.021	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0007	0.0071	0.5	2	25
Barium	1455		U	0.006	0.058	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0006	0.0060	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0005	0.0052	0.5	10	30
Nickel	1455		U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	0.0026	0.026	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.014	0.14	4	50	200
Chloride	1220		U	1.3	13	800	15000	25000
Fluoride	1220		U	0.11	1.1	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	28	280	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	7.7	77	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 25109 Marina Quater

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-42036							
Chemtest Sample ID:	1747975							
Sample Ref:	AA197452							
Sample ID:								
Sample Location:	TP03							
Top Depth(m):	1.00							
Bottom Depth(m):								
Sampling Date:						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		M	%	[A] 0.83	3	5	6
Loss On Ignition	2610		M	%	1.7	--	--	10
Total BTEX	2760		M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_1D_Total_CU	M	mg/kg	[A] < 10	500	--	--
Total (of 17) PAHs						100	--	--
pH at 20C	2010		M		8.8	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.018	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0005	0.0048	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0019	0.019	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0003	0.0034	0.5	10	30
Nickel	1455		U	0.0014	0.014	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.10	1.0	4	50	200
Chloride	1220		U	1.0	10	800	15000	25000
Fluoride	1220		U	0.11	1.1	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	31	310	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	8.2	82	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 25109 Marina Quater

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-42036							
Chemtest Sample ID:	1747978							
Sample Ref:	AA197456							
Sample ID:								
Sample Location:	TP04							
Top Depth(m):	1.00							
Bottom Depth(m):								
Sampling Date:								
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		M	%	[A] 0.24	3	5	6
Loss On Ignition	2610		M	%	2.1	--	--	10
Total BTEX	2760		M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_1D_Total_CU	M	mg/kg	[A] < 10	500	--	--
Total (of 17) PAHs						100	--	--
pH at 20C	2010		M		8.9	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.0060	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0002	0.0022	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0006	0.0062	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0005	0.0049	0.5	10	30
Nickel	1455		U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.060	0.60	4	50	200
Chloride	1220		U	1.1	11	800	15000	25000
Fluoride	1220		U	0.14	1.4	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	34	330	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	8.9	89	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 25109 Marina Quater

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-42036							
Chemtest Sample ID:	1747979							
Sample Ref:	AA192492							
Sample ID:								
Sample Location:	TP05							
Top Depth(m):	1.00							
Bottom Depth(m):								
Sampling Date:						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		M	%	[A] 0.42	3	5	6
Loss On Ignition	2610		M	%	1.9	--	--	10
Total BTEX	2760		M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_1D_Total_CU	M	mg/kg	[A] < 10	500	--	--
Total (of 17) PAHs						100	--	--
pH at 20C	2010		M		8.7	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.0080	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0004	0.0038	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0009	0.0086	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0002	0.0022	0.5	10	30
Nickel	1455		U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.044	0.44	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.11	1.1	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	28	280	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	6.9	69	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1747971	AA192494		TP01		A	Amber Glass 250ml
1747971	AA192494		TP01		A	Plastic Tub 500g
1747972	AA192495		TP01		A	Amber Glass 250ml
1747972	AA192495		TP01		A	Plastic Tub 500g
1747973	AA192496		TP02		A	Amber Glass 250ml
1747973	AA192496		TP02		A	Plastic Tub 500g
1747974	AA192497		TP02		A	Amber Glass 250ml
1747974	AA192497		TP02		A	Plastic Tub 500g
1747975	AA197452		TP03		A	Amber Glass 250ml
1747975	AA197452		TP03		A	Plastic Tub 500g
1747976	AA197453		TP03		A	Amber Glass 250ml
1747976	AA197453		TP03		A	Plastic Tub 500g
1747977	AA197455		TP04		A	Amber Glass 250ml
1747977	AA197455		TP04		A	Plastic Tub 500g
1747978	AA197456		TP04		A	Amber Glass 250ml
1747978	AA197456		TP04		A	Plastic Tub 500g
1747979	AA192492		TP05		A	Amber Glass 250ml
1747979	AA192492		TP05		A	Plastic Tub 500g
1747980	AA192493		TP05		A	Amber Glass 250ml
1747980	AA192493		TP05		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH at 20°C	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH at 20°C	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurememt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID

Test Methods

SOP	Title	Parameters included	Method summary
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

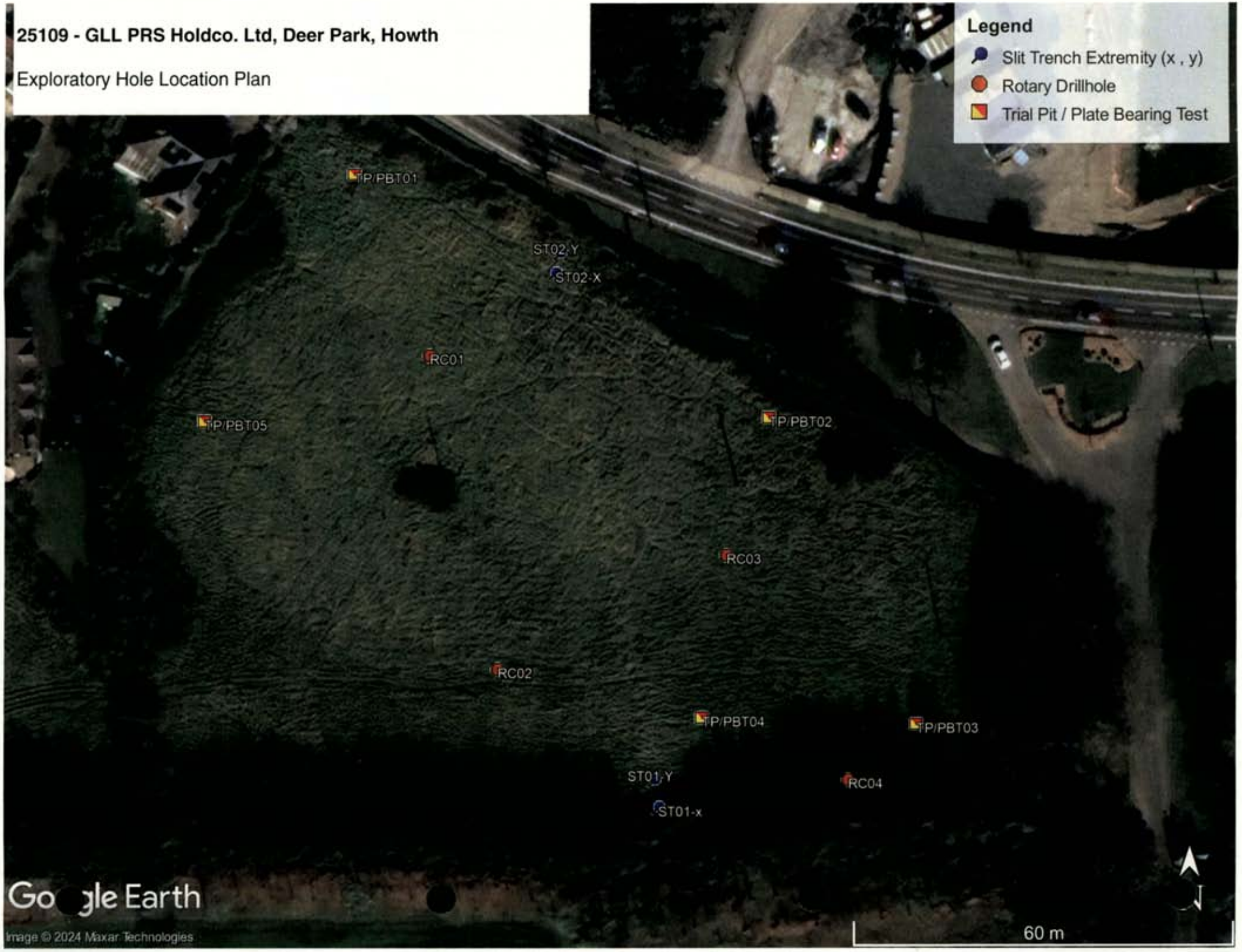
If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix 8

Exploratory Hole Location Plan

25109 - GLL PRS Holdco. Ltd, Deer Park, Howth

Exploratory Hole Location Plan



APPENDIX 10.1
IMPACT RATINGS AND ASSESSMENT CRITERIA

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APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 10.1 - Impact Ratings and Assessment Criteria

Table 1 Glossary of Impacts following EPA Guidance Documents (Draft 2017 Guidelines)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

APPENDIX 10.2
NRA CRITERIA FOR RATING THE MAGNITUDE AND SIGNIFICANCE OF IMPACTS AT EIA STAGE NATIONAL ROADS AUTHORITY (NRA, 2009)

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Appendix 10.2 - NRA Criteria for Rating the Magnitude and Significance of Impacts at EIA Stage National Roads Authority (NRA, 2009)

Table 1 Criteria for Rating Site Attributes – Estimation of Importance of Hydrological Attributes (NRA)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery. Locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding. Locally important amenity site for wide range of leisure activities.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes. Quality Class C (Biotic Index Q3, Q2- 3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1). Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 2 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrological Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss or extensive change to a waterbody or water dependent habitat. Increase in predicted peak flood level >100mm. Extensive loss of fishery. Calculated risk of serious pollution incident >2% annually. Extensive reduction in amenity value.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm. Partial loss of fishery. Calculated risk of serious pollution incident >1% annually. Partial reduction in amenity value.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm. Minor loss of fishery. Calculated risk of serious pollution incident >0.5% annually. Slight reduction in amenity value.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level. Calculated risk of serious pollution incident <0.5% annually.
Minor Beneficial	Results in minor improvement of attribute quality	Reduction in predicted peak flood level >10mm. Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually.
Moderate Beneficial	Results in moderate improvement of attribute quality	Reduction in predicted peak flood level >50mm. Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually.
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm

Table 3 Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	**Small Adverse**	**Moderate Adverse**	**Large Adverse**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

APPENDIX 10.3

WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

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MAY 2024

Water Framework Directive Compliance Assessment

10.3.1 Introduction

10.3.1.1 The Water Framework Directive

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy (European Parliament 2000) is known as the Water Framework Directive (WFD). The WFD established a framework for the protection of both surface and groundwaters. The WFD provides a vehicle for establishing a system to improve and / or maintain the quality of waterbodies across the European Union (EU). The Directive requires all waterbodies (river, lakes, groundwater, transitional, coastal) to attain 'Good Water Status' (qualitative and quantitative) by 2027. There are a number of WFD objectives in respect of which the quality of water is protected. The key objectives at EU level are the general protection of aquatic ecology, specific protection of unique and valuable habitats, the protection of drinking water resources, and the protection of bathing water (See Table A13.1). The objective is to achieve this through a system of river basin management planning and extensive monitoring. 'Good Status' means both 'Good Ecological Status' (GES) and 'Good Chemical Status' (GCS).

10.3.1.2 WFD Environmental Objectives

- Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water.
- Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.
- Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.
- Progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.
- Prevent Deterioration in Status and prevent or limit input of pollutants to groundwater.

The WFD was initially transposed into Irish law by S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003, as amended (hereafter referred to as the Water Policy Regulations). The Water Policy Regulations outline the water protection and water management measures required to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least 'Good' status for all waters. Subsequently, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (hereafter referred to as

the Surface Waters Regulations), and S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended (hereafter referred to as the Groundwater Regulations), were promulgated to regulate WFD characterisation, monitoring and status assessment programmes, in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments.

10.3.1.3 Article 4.7 of the WFD

Member states must meet the conditions of the WFD unless they meet the criteria laid out in Article 4.7 of the Directive. Article 4.7 states: Member states will not be in breach of this Directive when: - failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or - failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions are met:

a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;
b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;
c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development; and
d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

10.3.1.4 The WFD Assessment

In order to be compliant with the requirements of the WFD, any activity which has the potential to have an impact on WFD water bodies must be assessed to determine whether it could cause deterioration in the ecological status or potential of a water body. It is, therefore, necessary to consider the possible changes associated with the Proposed Scheme.

This WFD assessment report has been prepared for the Construction and Operational Phases of the Proposed Deer Park Howth Large-Scale Residential Development and is Appendix 10.3 of the Chapter 10 Water & Hydrology.

The generic environmental objectives set out below (based on Article 4.1 of the Directive) are used for the assessment of the Proposed Scheme:

- No changes affecting high status sites;
- No changes that will cause failure to meet surface water GES or GEP or result in a deterioration of surface water ecological status or potential;
- No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies; and
- No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.

10.3.2 Outline of the Proposed Scheme

Planning permission is sought for a large-scale residential development on an overall site of approx. 1.5 hectares. The development comprises the delivery of 135 dwellings including 63 no. 1-bedroom units and 72 no. 2-bedroom units across two offset blocks ranging in height from 3-5 storeys. 63 car parking spaces including 4 accessible spaces & 13 EV charging spaces and 6 motorcycle spaces proposed at surface level. A total of 410 bicycle spaces are proposed including the provision of secure bicycle stores. Partial demolition of 3 sections of the existing northern boundary wall, which fronts Howth Road, proposed to facilitate vehicular and pedestrian access. Undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipes around the site are also proposed.

10.3.3 Methodology

10.3.3.1 Study Area / WFD Screening

This WFD assessment covers only those components of the Proposed Scheme that could affect water body features. These were primarily identified as sections of the Proposed Scheme which are within 500m of surface and groundwater waterbodies (Chapter 10 Water & Hydrology). The assessment looks at the impacts of new modifications to the water bodies and any changes to existing modifications.

10.3.3.2 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for implementing and ensuring an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years. The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers Ireland as a whole (DHPLG 2018). For the second cycle, the original (2009) Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form one national River Basin District (RBD) which covers the whole of Ireland. For those waterbodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures impacting them

as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%). In September 2021, the Minister for Housing, Local Government and Heritage, published the draft River Basin Management Plan for Ireland 2022-2027 for public consultation. The consultation period closes March 2022. The draft RBMP sets out at the outset that it is published in the context of a rapidly changing policy landscape at European and International levels and against a backdrop of 'widespread, rapid and intensifying climate change'. In addition, Ireland is now experiencing a sustained decline in water quality following many years of improvements, and so stronger measures are now required to achieve sustainable water management in order to address and adapt to the impacts of climate change and achieve the desired outcomes for biodiversity. The reductions in water quality are especially notable for rivers; for other waterbodies the changes are more mixed; some reductions, some improvements. The draft RBMP cites a 4.4% net decline in the status of water bodies, and notes that this is mostly driven by a decline in the status of river water bodies. The characterisation and risk assessments carried out for the third cycle show that 33% of water bodies are At Risk of not meeting their environmental objective of good or high status. Of these, 46% of impacted by a single significant pressure. Agriculture remains the most common pressure, followed by hydromorphology, forestry and urban wastewater. There has been an increase in waterbodies impacted by agriculture since the 2nd cycle RBMP. The draft RBMP sets out a Programme of Measures (PoMs) necessary to deliver the objectives of the WFD in full and to contribute to other environmental priorities. Until the draft RBMP has been consulted upon and finalised, the existing RBMP has been used as a reference point for this assessment with respect to proposed measures as these have yet to be agreed; however, where waterbodies' 'At Risk ' status has already been updated by the EPA online for the third cycle RBMP, this has been used in the assessment.

10.3.3.3 Data Collection and Collation

The EPA's Data Explorer EPA Data Explorer, https://gis.epa.ie/EPAMaps/ was used to assess water bodies present within the Proposed Scheme's Study Area, and includes their WFD ID numbers, designation and classification details. The WFD compliance mapping for groundwater risk and status assessment was also reviewed along with any other supporting data.

10.3.3.4 Appraisal Method

In the absence of WFD assessment guidance in Ireland, the assessment has been carried out using the UK Environment Agency's 'Water Framework Directive assessment: Estuarine and Coastal waters' (Clearing the Waters for All) 2016 (updated 2017) (Environment Agency 2016). No specific guidance exists for freshwater waterbodies', however this guidance was used as the basis of the UK's Planning Inspectorate (PINS) Advisory Note 18 'Water Framework Directive' June 2017 (PINS 2017) in which it sets out the stages of an assessment. On this basis it was considered appropriate to use for the assessment of the Proposed Scheme. In line with this guidance a 2km buffer zone applied for assessing

protected areas. For clarity and brevity purposes, the 2km buffer and the full list of identified protected sites (including those which are considered coastal water specific) are maintained for all assessments. There follows a baseline assessment of the main water bodies, and a scoping assessment of the principal receptors potentially affected by the Proposed Scheme. This is followed by the impact assessment, which considers the potential impacts of an activity, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving GEP/GES.

There are several stages to this assessment:

- A scoping assessment of the main receptors including protected areas nature conservation, bathing water etc (Section 10.3.4);
- An assessment against quality elements including hydromorphology, biology, water quality, protected areas and invasive species (Section 10.3.5);
- Assessment of the Proposed Scheme against mitigation measures and a cumulative assessment against other proposed schemes (Section 10.3.6; and Section 10.3.6.1)
- Assessment against other EU Directives (Section 10.3.7).

10.3.4 Baseline scoping

10.3.4.1 Water body scoping

The WFD water bodies within the Study Area are as follows;

The WFD status of the Bloody Stream is classified as not at risk. The Irish Sea Dublin (HA 09) coastal waterbody hosts the Baldoyle Bay and according to the EPA information, has a 'Good' WFD status and is 'Not at risk' of not achieving good status.

10.3.4.2 Assessment Scoping

10.3.4.2.1 Protected areas

The WFD requires that activities are also in compliance with other relevant legislation, as considered below. The following are looked at as part of the assessment (as mentioned above, in line with guidance a 2km buffer zone was applied in this assessment):

- Nature conservation designations;
- Bathing waters;
- Nutrient Sensitive Areas; and,
- Shellfish waters.

10.3.4.2.2 Nature conservation designations

These are areas previously designated for the protection of habitats or species where maintaining or improving the status of water is important for their protection. They comprise the aquatic part of Natura2000 sites – Special Protection Areas (SPAs) designated under the Birds Directive (79/409/EEC) and Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC). Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The EPA data (https://gis.epa.ie/EPAMaps/) was used to find out the nature conservation designations within 2km of the Proposed Scheme.

The Dublin Bay Ramsar Site is located 2km west of the proposed development and the North Bull Island Ramsar Site is located 1.3km South West of the proposed development. The Baldoyle SAC and North-west Irish Sea SPA are located 170m to the north of the site and 1.5km west of the site. The Howth Head Coast SPA is also located 2km west of the site.

10.3.4.2.3 Bathing waters

Bathing waters are those designated under the Bathing Water Directive (76/160/EEC) or the later revised Bathing Water Directive (2006/7/EC). Bathing Water Quality Regulations were adopted in March 2008 (following a public consultation) transposing the EU Bathing Water Directive of 2006 into Irish law. Water quality data is collected for nearby Claremont Beach bathing area and is reported by the EPA on www.beaches.ie. The EPA bathing status is not based on single events, rather it is based on a review of data over 4 years (based on data collected during the bathing season only). Bathing classes are determined as Excellent (highest cleanest class), Good (Generally good water quality), Sufficient (The water quality meets the minimum standard) and Poor (The water quality has not met the minimum standard). A review of this data for the last four years, shows that the Claremont Beach is classified as achieving Sufficient Water Quality in 2019 based on the assessment of bacteriological results for the period 2016 to 2019. Claremont Beach had a Sufficient Water Quality rating in 2018 and 2017 and achieved a Good Water Quality rating in 2016.

10.3.4.2.4 Nutrient sensitive areas

Nutrient sensitive areas comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). The UWWTD aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban wastewater. Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate

concentrations and act as an indication that action is required to prevent further pollution caused by nutrients. There are no nutrient sensitive areas within 2km of the proposed development.

10.3.4.2.5 Shellfish waters

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth. It is designed to protect the aquatic habitat of bivalve and gastropod molluscs, which include oysters, mussels, cockles, scallops and clams. The Directive requires Member States to designate waters that need protection in order to support shellfish life and growth. It is implemented in Ireland by the European Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268 of 2006). The Directive also provides for the establishment of pollution reduction programmes for the designated waters. There are no shellfish waters within 2km of the Proposed Scheme.

10.3.5 Waterbody assessment against quality elements

This section details a site-specific assessment of the Proposed Scheme against quality elements for biology, physico-chemical and hydromorphological elements for the transitional water bodies following the 'Clearing the Waters for All' guidance.

10.3.5.1 Hydromorphology

There are no instream works proposed as part of the Proposed Scheme. There is no predicted exposure route to groundwater. Surface water drainage flow and volume will not change as it remains at Qbar as part of the Proposed Scheme. This element is scoped out of the assessment.

10.3.5.2 Biology

10.3.5.2.1 Habitats

Table 1 presents a summary of biology (habitat) considerations and associated risk issues for the works for the transitional water body.

Table 1 Biology Scoping Summary

WFD Assessment Questions	Dublin Bay Ramsar Site	North Bull Island Ramsar Site	Baldoyle SAC	North West Irish Sea SPA	Howth Head Coast SPA	Claremont Beach
Is the footprint of the activity 0.5km^2 or larger	No					
Is the footprint of the activity 1% or more of the water body's area?	No					

For biological elements potential construction impacts are often considered as they have the potential for long-term change if a potential impact is considered to be significant. Therefore, it is important to also note that the Construction Management Plan (MP) includes a Surface Water Management Plan (SWMP) which will be implemented for construction management and sediment control measures respectively. Therefore, this element has been scoped out of further assessment.

10.3.5.2.2 Fish

Activities occurring within an estuary or inshore environment could impact on normal fish behaviour such as movement, migration or spawning. **Table 2** presents a summary of biology (fish) considerations and associated risk issues for the works. As at least one biology (fish) consideration indicates that a risk could be associated with the works, this receptor has been scoped into the impact assessment for the transitional water body.

Table 2 Biology (fish) Scoping Summary

WFD Assessment Questions	**Dublin Bay Ramsar**	**North Bull Island Ramsar**	**Baldoyle SAC**	**North West Irish Sea SPA**	**Howth Head Coast**	**Claremont Beach**
Consider if your activity is in an estuary and could affect fish in the estuary, outside of the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	No. No instream works proposed.					
Consider if your activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or change in depth or flow.	No. No change in surface water volume of flow from the proposed site.					
Consider if your activity could cause entrainment or impingent of fish?	No. No instream works proposed.					

In the unlikely event of an accidental spillage, the emergency response plan will be activated, and onsite spill kits utilised. Furthermore, no instream works are proposed as part of this Proposed Scheme. The Proposed Scheme does not propose to increase the current flow or volume of surface water runoff. This element has been scoped out of this assessment.

10.3.5.3 Water quality

Consideration is also made regarding whether phytoplankton status and harmful algae could be affected by the works, as well as identifying the potential risks of using, releasing or disturbing chemicals. Table 3 presents a summary of water quality considerations and associated risk issues of the works for the transitional water body.

Table 3 Water Quality Considerations and associated risk issues of the works

WFD Assessment Questions	Dublin Bay Ramsar Site	North Bull Island Ramsar Site	Baldoyle SAC	North West Irish Sea SPA	Howth Head Coast SPA	Claremont Beach
Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	No					
Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad?	No.					
Consider if your activity is in water body with a history of harmful algae?	No					
If your activity uses or releases chemicals (for example through sediment disturbance or buiding works) consider if the chemicals are on the Environmental Qualoity Stands Directive (EQSD) list?	During construction there is potential for accidental release of hydrocarbons however with the implementation of the mitigation measures outline in the CMP and Construction Stage Surface Water Management Plan there will be no significant impacts. No substances on the EQSD list will be released during operation.					
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the Environmental Quality Standards Directive (EQSD) list?	No. The discharge of surface water during operation will not include any EQSD list substances.					
Consider if ancillary sources of discharge contribute to water quality status (e.g. UWWTP stormwater overflow (SWO) combined sewer overflow (CSP) etc.	No.					

This element has been scoped out of the impact assessment. A CMP, which includes a Construction Stage Surface Water Management Plan will also be implemented to mitigate potential impacts in relation to surface water contamination. It is important to note that the Proposed Scheme does not propose any changes to the current volume of surface water runoff.

10.3.5.4 Protected areas

Table 4 presents a summary of protected area considerations.

Table 4 Protected Areas

WFD Assessment Question	Dublin Bay Ramsar Site	North Bull Island Ramsar Site	Baldoyle SAC	North West Irish Sea SPA	Howth Head Coast SPA	Claremont Beach
Consider of your activity is within 2km of any WFD protected area?	As a result of the design of the project and prevention and mitigation measures to be taken, there is not likely to be a significant effect on surface and groundwater quantity and quality from the proposed development either alone or in combination with other plans or projects. The project is not likely to cause a deterioration in surface or groundwater status or to compromise the ability of any surface or groundwater to meet the objectives of					

	the Water Framework Directive (WFD) Directive 2000/60/EC (as amended)) and River Basin Management Plan; that there are not likely to be any significant discharges of pollutants from priority or other polluting substances to groundwater or surface water so that the chemical status of the surface and groundwater will not deteriorate. Moreover, the ecological status of surface waters is not likely to be significantly affected by any discharge to surface waters and as established in other chapters of this EIAR and AA screening, there is not likely to be a significant effect on any European or other protected site in view of their conservation objectives. The proposed development is not likely to have a significant adverse effect on the water & hydrology environment of the site and surrounding area, either alone or in combination with other existing and/or approved projects. Finally, as a result of the complete, precise and definitive findings of the Natura Impact Statement prepared by Enviroguide under separate cover, it has been concluded, beyond reasonable scientific doubt, that the Proposed Development will have no significant adverse effects on the QIs, SCIs and on the integrity and extent of Baldoyle Bay SAC (000199) and/or North-west Irish Sea SPA (004236). Accordingly, the Proposed Development will not adversely affect the integrity of any relevant European site.

10.3.5.5 Invasive Species (IS)

Consideration should be made regarding whether there is a risk the activity could introduce or spread IS. Risks of introducing or spreading IS include materials or equipment that have come from, had use in or travelled through other water bodies, as well as activities that help spread existing IS, either within the immediate water body or other water bodies. In accordance with the Natura Impact Statement, No invasive alien plant species that could lead to likely significant effects on Europeansites were therefore recorded on Site. Therefore, this element has been scoped out of the assessment.

A13.6 Assessment of the Proposed Scheme against WFD Programme of Measures (PoMs)

There is a list of measures, or environmental improvements, which have been identified by the RBMP (known as the Programme of Measures (PoMs) in the RBMP for Ireland), which need to be implemented in order to improve the ecology of water bodies by a specified date in order for Ireland to meet the target date set by the Water Framework Directive. Part of the WFD compliance assessment is to consider these PoMs and assess whether the Proposed Scheme can contribute to them or prevent any of them from being delivered. As the proposed scheme does not increase the current flow (surface water discharge form the site is limited to greenfield runoff rates Qbar) or sediment load to surface water bodies and will not impede any waterbody reaching good status or potential.

10.3.6.1 Cumulative assessment

The Proposed Scheme has been assessed for the potential for cumulative impacts with other Proposed Developments within 500m of the Study Area in Volume 2 of the EIAR. This concludes that in

combination with other Proposed Developments the Proposed Scheme will not compromise the achievement of the objectives of the WFD for any water body.

10.3.7 Assessment of the Proposed Scheme Against WFD Objectives

Taking into consideration the anticipated impacts of the Proposed Scheme on the biological, physico-chemical and hydromorphological quality elements, following the implementation of design and mitigation measures, it is concluded that it will not compromise progress towards achieving Good Ecological Status (GES) or cause a deterioration of the overall Good Ecological Potential (GEP) of any of the water bodies that are in scope as outlined in Table 5 below.

Table 5 Compliance of the Proposed Scheme with the Environmental Objectives of the WFD

Environmental Objective	Proposed Scheme	Compliance with the WFD Directive
No changes affecting high status sites	The proposed scheme dies no affect high status sites	Yes
No changes that will cause failure to meet surface water GES or GEP or result in deterioration of surface water GES or GEP	The proposed scheme does not result in failure to meet surface water GES or GEP or result in deterioration of surface water GES or GEP	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies	The proposed scheme will not permanently prevent or compromise the Environmental Objectives being met in other water bodies	Yes
No changes that will cause failure to meet good groundwater or result in a deterioration of groundwater status	The proposed scheme will not cause deterioration in the status of the groundwater bodies	Yes

The WFD also requires consideration of how a new scheme might impact on other water bodies and other EU legislation. This is covered in Articles 4.8 and 4.9 of the WFD. Article 4.8 states: '*a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation'*. All water bodies within the Study Area have been assessed for direct impacts and indirect impacts. The assessment concludes that the Proposed Scheme will not compromise the achievement of the objectives of the WFD for any water body. In addition, the Proposed Scheme has been assessed for the potential for cumulative impacts with other Proposed Developments within 500m of the Study Area. This concludes that in combination with other Proposed Developments the Proposed Scheme will not compromise the achievement of the objectives of the WFD for any water body. Therefore, the Proposed Scheme complies with Article 4.8. Article 4.9 of the WFD requires that "*Member States shall ensure that the application of the new provisions guarantees at least the same level of protection as the existing Community legislation*". The Habitats Directive (1992) promotes the maintenance of biodiversity by

requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance. There are European designated sites in the vicinity of the Proposed Scheme which have been assessed and are presented in the Appropriate Assessment Screening Report and Natura Impact Statement (NIS) submitted with the application. The Nitrates Directive (1991) aims to protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. The Scheme will not influence or moderate agricultural land use or land management. The revised Bathing Water Directive (rBWD) (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Bathing Water Directive (BWD) (76/160/EEC) and the process used to measure/monitor water quality at identified bathing waters. The rBWD focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the BWD. Bathing waters under the rBWD are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (intestinal enterococci and Escherichia coli) in samples obtained during the bathing season (May to September). The Proposed Scheme will not impact any designated bathing waters as there are not any less than 2km from the Proposed Scheme. It is therefore compliant with the Bathing Water Directive.

10.3.8 Conclusion

Taking into consideration the impacts of the Proposed Scheme on the biological, physico-chemical and hydromorphological quality elements, it is concluded that following the implementation of design and mitigation measures, it is concluded that it will not compromise progress towards achieving GES or GEP or cause a deterioration of the overall status of the water bodies that are in scope; it will not compromise the qualifying features of protected areas and is compliant with other relevant Directives. It can therefore be concluded that the Proposed Scheme is fully complaint with WFD and therefore does not require assessment under Article 4.7 of the WFD.

A13.9 References

Environment Agency's 'Water Framework Directive assessment: Estuarine and Coastal waters' 2016 'Clearing Waters for All' (updated 2017) (Environment Agency 2016).

Planning Inspectorate (PINS) Advisory Note 18 'Water Framework Directive' June 2017 (PINS 2017)

Water Dependent Habitats and Species and High Status Sites
https://www.catchments.ie/download/water-dependent-species-habitats-guidance/

Council Directive (76/160/EEC) Bathing Water and revised (2006/7/EC).

Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive)

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive

2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment

S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003

S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations 2006

S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010

S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009

S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014

S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations 2011

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011

APPENDIX 10.4
CONFIRMATION OF FEASIBILITY

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

CONFIRMATION OF FEASIBILITY

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22 May 2024

Our Ref: CDS23004194 Pre-Connection Enquiry
Howth Road, Deer Park, Howth, Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Multi/Mixed Use Development of 135 unit(s) at Howth Road, Deer Park, Howth, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection**
  - Feasible without infrastructure upgrade by Uisce Eireann
  - The Development can be supplied from to the existing 160mm MOPVC main on Howth Road.
    The connection main should be a 150mm ID pipe.

- **Wastewater Connection**
  - Feasible Subject to upgrades
  - In order to accommodate the proposed connection at the Premises, upgrade works are required to create capacity in the network. Approximately 55m of existing 225mm wastewater on Dungriffin Road is to be replaced to remove infiltration in the network (subject to

further review at connection application stage). Uisce Eireann does not currently have any plans to carry out the works required to provide the necessary capacity. Should you wish to have such upgrade works progressed by Uisce Eireann, Uisce Eireann will require you to provide a contribution of a relevant portion of the costs for the required upgrades at connection application stage.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278.

Yours sincerely,

Dermot Phelan

Connections Delivery Manager

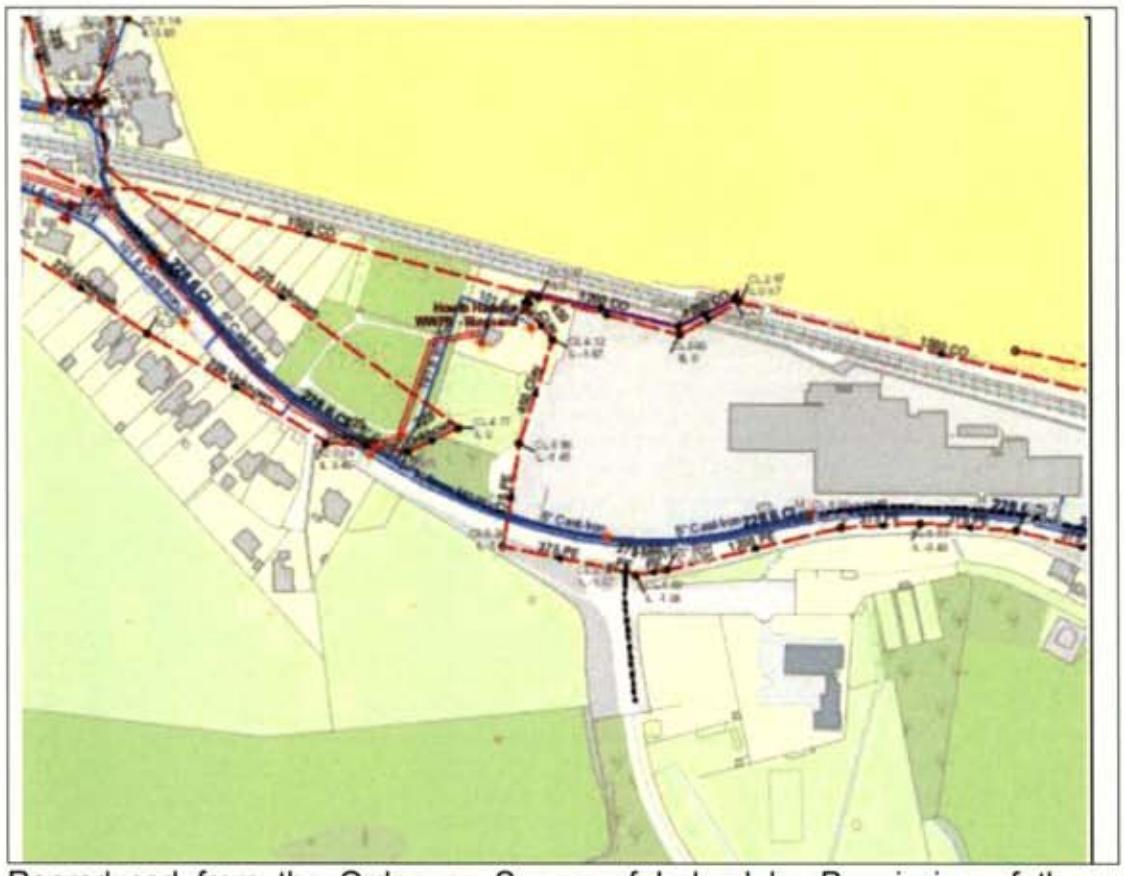
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



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Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to

excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

APPENDIX 10.5
STATEMENT OF DESIGN ACCEPTANCE

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Uisce Éireann
Irish Water

Paul Doyle
Donnachadh O' Brien & Associates
Unit 5C Elm House
Millenium Park
Naas
Kildare
W91P9P8

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

3 April 2024

Re: Design Submission for Howth Road, Deer Park, Howth, Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS23004194

Dear Paul Doyle,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Uisce Éireann has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before you can connect to our network you must sign a connection agreement with Uisce Éireann. This can be applied for by completing the connection application form at www.water.ie/connections. Uisce Éireann's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Uisce Éireann's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Uisce Éireann does not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Uisce Éireann representative:
Name: Antonio Garzón Mielgo
Phone: 0874750587
Email: antonio.garzonmielgo@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- 2326-DOB-XX-SI-DR-C-0300 P07
- 2326-DOB-XX-SI-DR-C-0400-S2.P06_Pr. Water Supply
- 2326-DOB-XX-SI-DR-C-1450 P05

Additional Comments

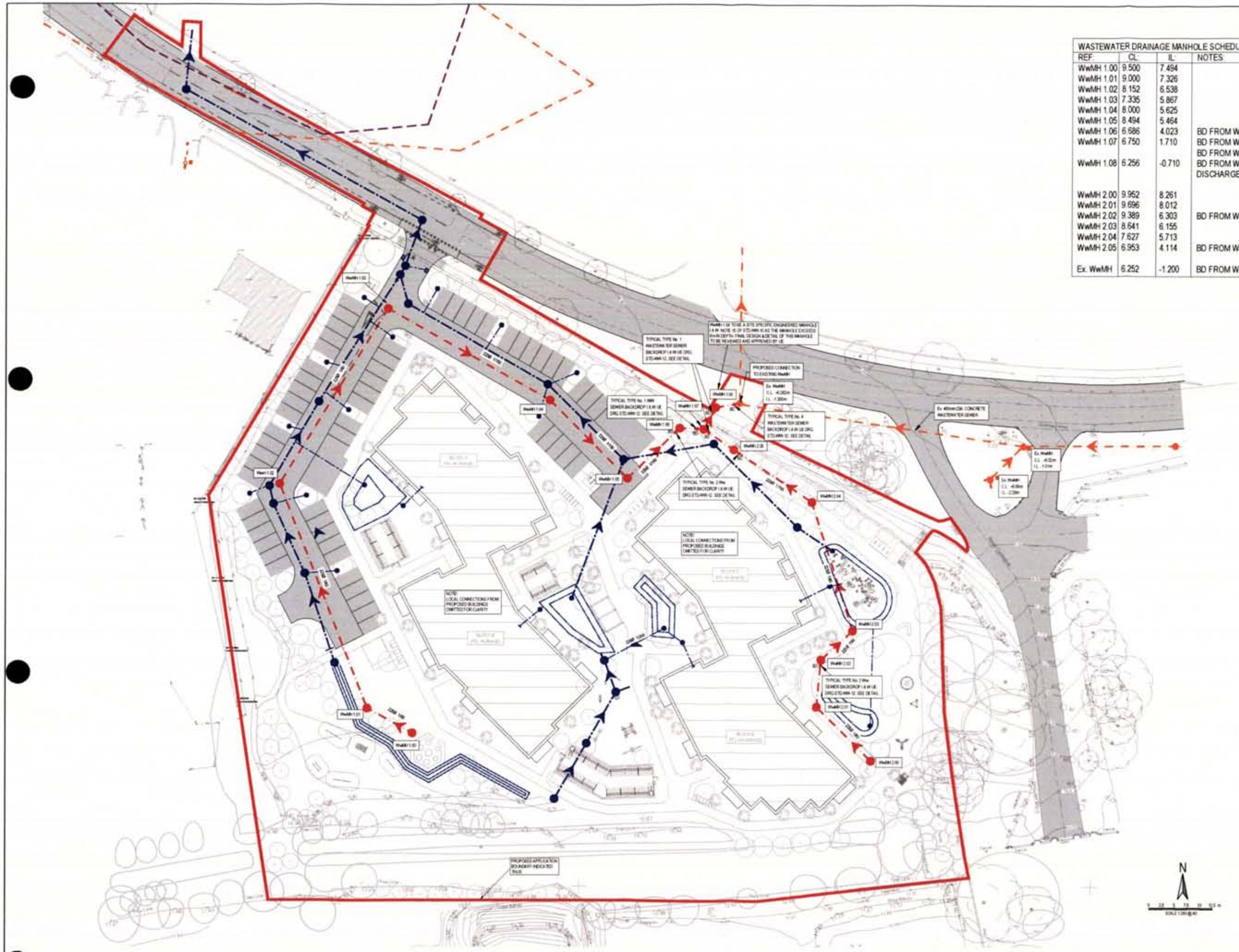
The design submission will be subject to further technical review at connection application stage.

Uisce Éireann cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

The layout of the service connections shall be such as to allow, wherever possible, connection to the general receiving sewer in the direction of the flow of that sewer.

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Uisce Éireann will not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.



WASTEWATER DRAINAGE MANHOLE SCHEDULE			
REF:	CL:	IL:	NOTES:
WwMH 1.00	9.500	7.494	
WwMH 1.01	9.000	7.326	
WwMH 1.02	8.152	6.538	
WwMH 1.03	7.335	5.867	
WwMH 1.04	8.000	5.625	
WwMH 1.05	8.494	5.464	
WwMH 1.06	6.586	4.023	BD FROM WwMH 1.05 @ 5.387
WwMH 1.07	6.750	1.710	BD FROM WwMH 1.06 @ 3.991
			BD FROM WwMH 2.05 @ 4.042
WwMH 1.08	6.256	-0.710	BD FROM WwMH 1.07 @ 1.669
			DISCHARGE TO EX.WwMH
WwMH 2.00	9.952	8.261	
WwMH 2.01	9.696	8.012	
WwMH 2.02	9.389	6.303	BD FROM WwMH 2.01 @ 7.858
WwMH 2.03	8.641	6.155	
WwMH 2.04	7.627	5.713	
WwMH 2.05	6.953	4.114	BD FROM WwMH 2.04 @ 5.529
Ex. WwMH	6.252	-1.200	BD FROM WwMH 1.08 @ -0.742

NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2326-DOB-XX-SI-DR-S-0001 & S-0002
2. REFER TO ARCHITECTS DRAWINGS FOR ALL SITE & APPLICATION BOUNDARIES
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS
4. USE FIGURED DIMENSIONS ONLY. DO NOT SCALE
5. REFER TO SURVEY DRAWINGS FOR EXISTING SERVICES LAYOUTS AND MANHOLE INFORMATION
6. ALL EXISTING SURFACES TO BE REINSTATED FOLLOWING DIVERSION OF SERVICES/CONSTRUCTION OF NEW SERVICES
7. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LEVELS WITH ARCHITECTURAL DRAWINGS PRIOR TO START OF CONSTRUCTION AND DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER & ARCHITECT FOR RESOLUTION
8. CONTRACTOR TO DESIGN ALL WATER & WASTEWATER RELATED WORKS ARE IN ACCORDANCE WITH THE IRISH WATER WATER INFRASTRUCTURE & WASTEWATER INFRASTRUCTURE CODE OF PRACTICE & STANDARD DETAILS DOCUMENTS
9. TESTING OF ALL GRAVITY SEWERS AND MANHOLES TO BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE SECTION 11 TESTING OF GRAVITY SEWERS & MANHOLES

WASTEWATER LEGEND:

- EX. WASTEWATER SEWER
- EX. WASTEWATER MANHOLE
- EX. WASTEWATER INSPECTION CHAMBER
- EX. WASTEWATER ACCESS JUNCTION
- EX. COMBINED SEWER
- EX. COMBINED MANHOLE
- EX. WASTEWATER RISING MAIN
- EX. WASTEWATER SEWER TO BE DECOMMISSIONED
- PR. WASTEWATER SEWER
- PR. WASTEWATER MANHOLE
- PR. WASTEWATER INSPECTION CHAMBER
- PR. WASTEWATER ACCESS JUNCTION
- PR. WASTEWATER RISING MAIN
- PR. BACKDROP M-MH
- PR. LOCAL FOUL DRAINAGE

NOTE 1: MANHOLE COVER LEVELS ARE APPROXIMATE. ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O.

NOTE 2: **ALL WASTEWATER SEWERS TO BE PROVIDED WITH COVER (WITHOUT PROTECTION) IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-WW-07 AND CLAUSE 3.9 OF IW-CDS-5030-08.**

NOTE 3: **FOR WASTEWATER SEWERS REQUIRING PROTECTION, REFER TO IRISH WATER STANDARD DETAIL STD-WW-08 AND CLAUSE 3.9 OF IW-CDS-5030-08.**

NOTE 4: **ALL MANHOLES WHERE MANHOLE COVERS ARE LOCATED IN GRASS/ SOFT LANDSCAPED AREAS TO ENSURE THAT MH COVERS ARE IDENTIFIABLE, ACCESSIBLE AND WILL NOT BECOME OVERGROWN. COVERS ARE TO BE SURROUNDED BY A CONCRETE PLINTH, 300mm ALL AROUND AND 300mm DEEP FORMED WITH C30/37N CONCRETE, 20mm AGGREGATE SIZE, BOXED IN CLAUSE 804 MATERIAL**

WASTEWATER PIPE MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5030-03 SECTION 3.13.2

3.13.2 THERMOPLASTIC STRUCTURAL WALL PIPES: THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF S EN 13476 (2007/2008). PIPES TO BE OF STIFFNESS CLASS (kN/m²) & TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,000 PSI (150 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 2.3 OF WIS 4-35-01 (2009). (SEWER DIAMETERS: 150mm uP TO 450mm). SERVICE CONNECTIONS (IF 100mm DIAMETER)

ISSUED FOR PLANNING

Rev	Note	Date	Drawn	Check
02 P07	ISSUED FOR PLANNING	03.04.2024	MJC	PD
02 P06	ISSUED FOR PLANNING	15.03.2024	MJC	PD
02 P05	ISSUED FOR UE D.S.A APPROVAL	24.11.2023	MJC	PD
02 P04	ISSUED FOR LRD OPINION	06.11.2023	MJC	PD
02 P03	APPLICATION BOUNDARY INCLUDED	27.10.2023	BB	PD
02 P02	ISSUED FOR INFORMATION	25.10.2023	MF	PD
02 P01	ISSUED FOR INFORMATION	02.08.2023	BB	PD

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Tel: +353 45 904 542
www.oabrien-hydrology.ie

Client:	GLL PRS HOLDCO.
Project:	DEER PARK HOWTH LRD
Drawing Title:	PROPOSED WASTEWATER DRAINAGE LAYOUT

Drawn By	Checked By	Approved By	Date	Scale	Sheet Size
BB	PD	DOB	JUL * 2023	1:250	A0

Project Number	Drawing Number	Status Code	Rev Number
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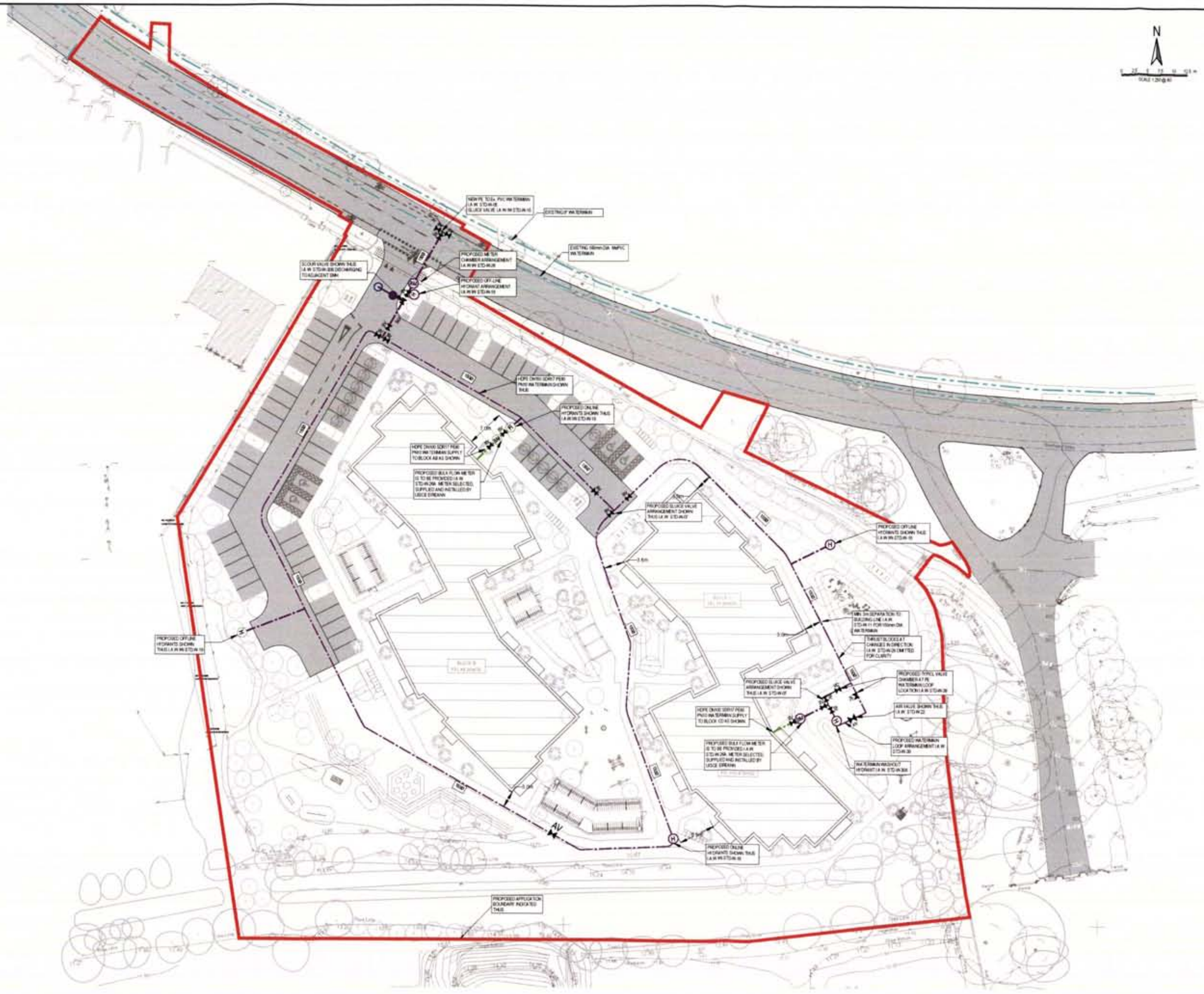

NOTES:

1. FOR STANDARD DCBA NOTES REFER TO DRAWING 2326-DOB-XX-SI-DR-G-0001 & G-0002
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9. TESTING OF ALL GRAVITY SEWERS AND MANHOLES TO BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE SECTION 4.10 TESTING OF GRAVITY SEWERS & MANHOLES

WATER SUPPLY LEGEND:

- Ex. WATERMAIN
- Ex. WATERMAIN TO BE DECOMMISSIONED
- PR. 110mm DIA. WATERMAIN
- PR. 160mm DIA. WATERMAIN
- PR. 200mm DIA. WATERMAIN
- PR. HYDRANT
- PR. BULK METER
- PR. BOUNDARY BOX
- PR. AIR VALVE
- PR. SLUICE VALVE
- PR. SCOUR VALVE
- PR. PRESSURE REDUCING VALVE
- THRUST BLOCKS (OMITTED FOR CLARITY)

NOTE 1: MANHOLE COVER LEVELS ARE APPROXIMATE ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O

NOTE 2: **ALL WATERMAINS TO BE PROVIDED WITH COVER IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-W-10 AND CLAUSE 3.11 OF IW-CDS-5030-05.**

NOTE 3: **ALL MANHOLE COVERS LOCATED IN GRASS AREAS TO BE SURROUNDED (MIN. 300mm SURROUND) IN 300mm THK C30/25 CONCRETE APRON**

NOTE 4: **ALL WATERMAINS TO BE PROVIDED WITH SUGGESTED OFFSETS TO EXISTING &/OR/ OR PROPOSED PLANTING I.A.W IW STD-W-12A. APPROPRIATE PROTECTION MEASURES SHALL BE PROVIDED TO PREVENT ROOT INGRESS. SEE SECTION 5.2A OF WATER CoP FOR FURTHER INFORMATION**

NOTE 5: **AIR VALVE AND HYDRANT COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 300mm ALL AROUND AND 300mm DEEP, FORMED WITH C30/25 CONCRETE, 20mm AGGREGATE SIZE, AND MIXED IN CLAUSE 804 MATERIAL.**

THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCEMENT LINKS AND SHALL HAVE A BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER. SEE SECTION 5.3B OF WATER CoP

WATERMAIN MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5070-03 SECTION 3.9.2

3.9.2 MDPE & HDPE PIPES SHALL BE OF A TYPE PE80 & HAVE AN SDR 11 OR SDR 17 RATING. THEY SHALL CONFORM TO IS EN 12201-PART 1 & PART 2 PLASTIC SYSTEMS FOR WATER SUPPLY, DRAINAGE & SEWERAGE UNDER PRESSURE - PART 1, GENERAL & PART 2, PIPES & I.S. EN 12201-3 PLASTIC SYSTEMS FOR WATER SUPPLY, DRAINAGE & SEWERAGE UNDER PRESSURE - PART 3 FITTINGS.

ISSUED FOR PLANNING

Rev	Note	Date	Drawn	Check
S2 P06	ISSUED FOR PLANNING	15.03.2024	BB	PD
S2 P05	ISSUED FOR UE D S A APPROVAL	24.11.2023	MJC	PD
S2 P04	ISSUED FOR LRD OPINION	08.11.2023	MJC	PD
S2 P03	APPLICATION BOUNDARY INCLUDED	27.10.2023	BB	PD
S2 P02	ISSUED FOR INFORMATION	25.10.2023	BB	PD
S2 P01	ISSUED FOR INFORMATION	02.08.2023	BB	PD

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PHONE +353 45 844 340
WEB WWW.DOBRIEN.IE

Client: GLL PRS HOLDCO.
Project: DEER PARK HOWTH LRD
Drawing Title: PR. WATER SUPPLY LAYOUT

Drawn By	Checked By	Approved By	Date	Scale	Sheet Size
BB	PD	DOB	AUG 22	1:250	A0

Project Number	Drawing Number	Status Code	Rev Number
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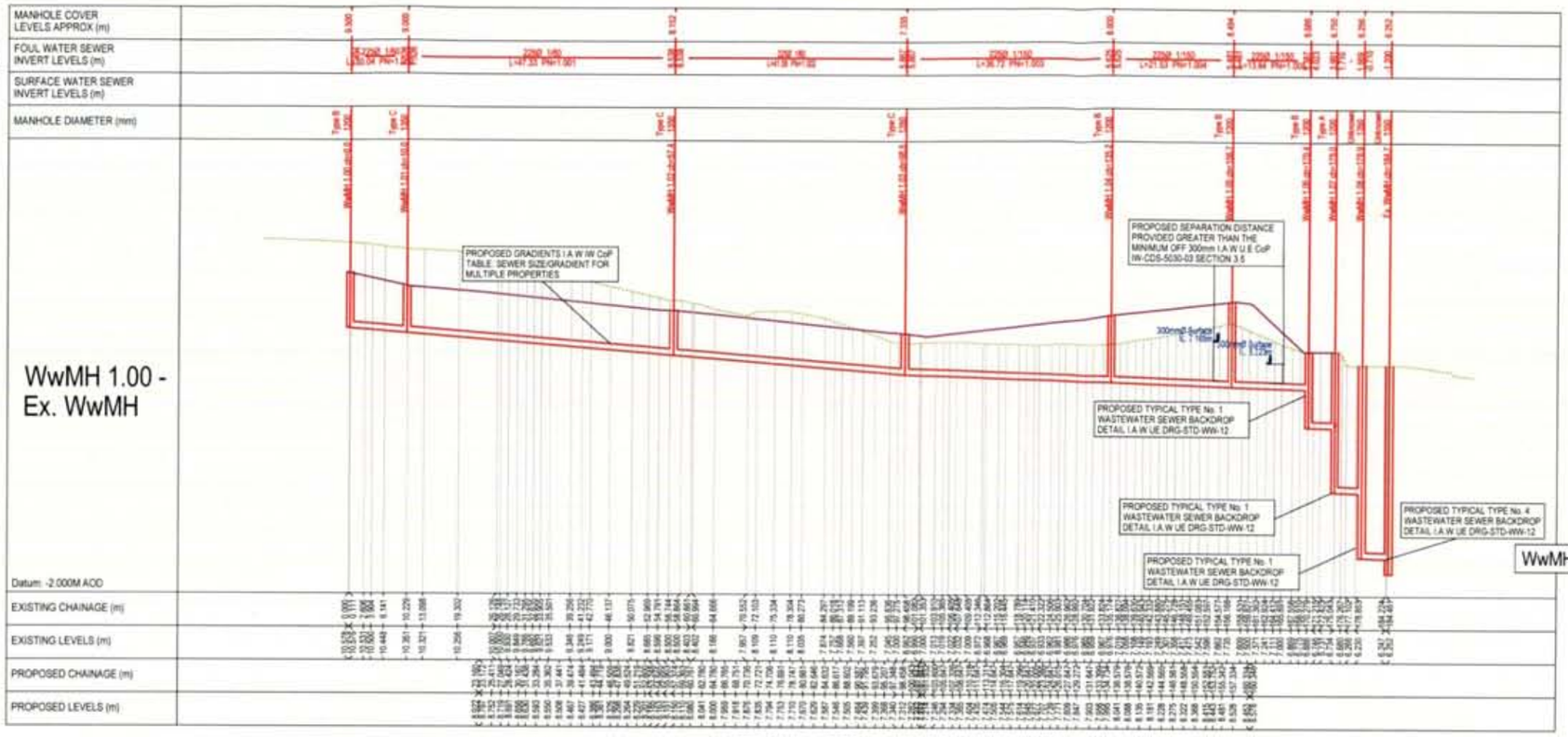
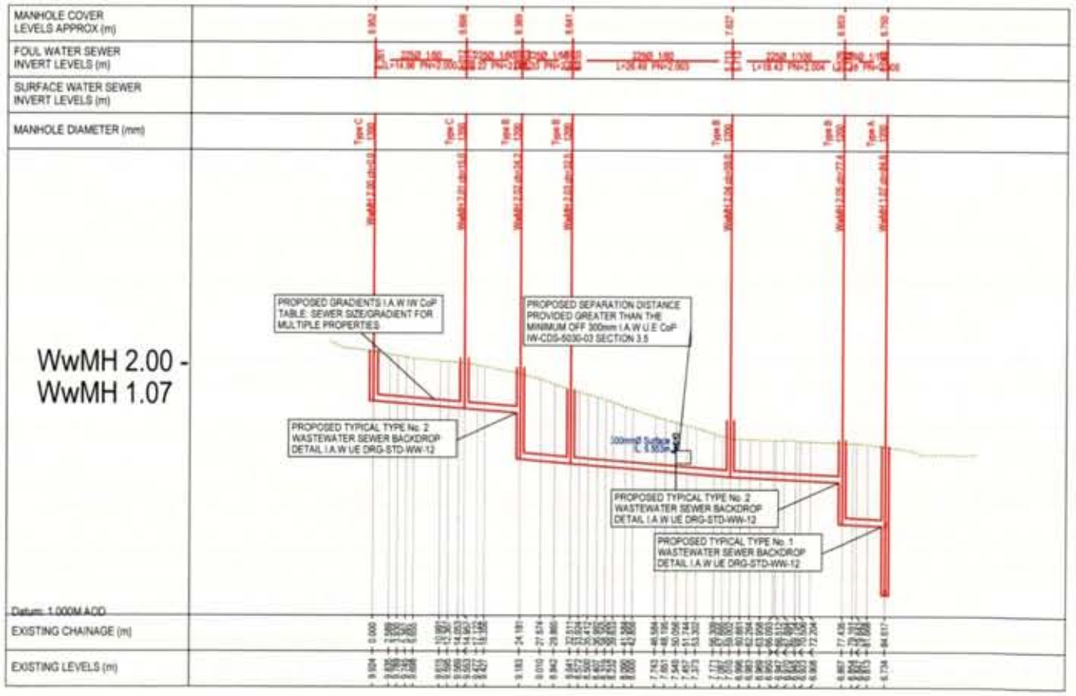


PROPOSED LONGITUDINAL SECTION WwMH 1.00 - Ex. WwMH
SCALE 1:500



PROPOSED LONGITUDINAL SECTION WwMH 2.00- 1.07
SCALE 1:500

NOTES:

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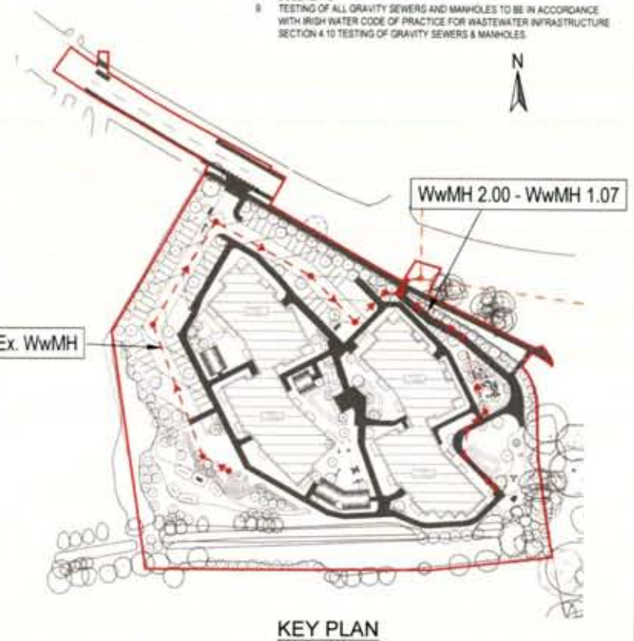

KEY PLAN
SCALE 1:1000

LEGEND:
- PROPOSED SURFACE WATER
- PROPOSED FOUL WATER
- PROPOSED GROUND/ ROAD LEVEL
- EXISTING GROUND PROFILE

ISSUED FOR PLANNING

Rev.	Note	Date	Drawn	Check
S2.P05	ISSUED FOR PLANNING	03.04.2024	MJC	PD
S2.P04	ISSUED FOR PLANNING	15.03.2024	MJC	PD
S2.P03	ISSUED FOR LRD OPINION	06.11.2023	MJC	PD
S2.P02	APPLICATION BOUNDARY INCLUDED	27.10.2023	BB	PD
S2.P01	ISSUED FOR INFORMATION	25.10.2023	MJC	PD

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Client:	GLL PRS HOLDCO. LTD
Project:	DEER PARK HOWTH LRD
Drawing Title:	PROPOSED WW LONGITUDINAL SECTIONS

Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
MJC	PD	PD	MAY' 22	1:500	A1

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2326	2326-DOB-XX-SI-DR-C-1450	S2	P05

APPENDIX 11.1
RELEVANT LEGISLATION AND POLICY

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 11.1 – Relevant Legislation and Policy

International Legislation

EU Birds Directive

The Birds Directive constitutes a level of general protection for all wild birds throughout the European Union. Annex I of the Birds Directive includes a total of 194 bird species that are considered rare, vulnerable to habitat changes or in danger of extinction within the European Union. Article 4 establishes that there should be a sustainable management of hunting of listed species, and that any large scale non-selective killing of birds must be outlawed. The Directive requires the designation of Special Protection Areas (SPAs) for: listed and rare species, regularly occurring migratory species and for wetlands which attract large numbers of birds. There are 25 Annex I species that regularly occur in Ireland.

EU Habitats Directive

The Habitats Directive aims to protect some 220 habitats and approx. 1000 species through-out Europe. The habitats and species are listed in the Directives annexes where Annex I covers habitats and Annex II, IV and V cover species. There are 59 Annex I habitats in Ireland and 33 Annex IV species which require strict protection wherever they occur. The Directive requires the designation of Special Areas of Conservation (SACs) for areas of habitat deemed to be of European interest. The SACs together with the SPAs from the Birds Directive from a network of protected sites called Natura 2000.

Bern and Bonn Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) was enacted to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was introduced in order to give protection to migratory species across borders in Europe.

Ramsar Convention

The Ramsar Convention on Wetlands is an intergovernmental treaty signed in Ramsar, Iran, in 1971. The treaty is a commitment for national action and international cooperation for the conservation of wetlands and their resources. In Ireland there are currently 45 Ramsar sites which cover a total area of 66,994ha.

Water Framework Directive

The EU Water Framework Directive (WFD) 2000/60/EC is an important piece of environmental legislation which aims to protect and improve water quality. It applies to rivers, lakes, groundwater, estuaries, and coastal waters. The Water Framework Directive was agreed by all individual EU member states in 2000, and its first cycle ran from 2009 – 2015. The Directive runs in 6-year cycles; the second cycle ran from 2016 – 2021, and the current (third) cycle runs from 2022-2027. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high-water quality status where it exists. The WFD requires member states to manage their water resources on an integrated basis to achieve at least 'good' ecological status, through River Basin Management Plans (RBMP), by 2027.

National Legislation

Wildlife Act 1976 and amendments

The Wildlife Act 1976 was enacted to provide protection to birds, animals, and plants in Ireland and to control activities which may have an adverse impact on the conservation of wildlife. With regard to the listed species, it is an offence to disturb, injure or damage their breeding or resting place wherever these occur without an appropriate licence from the National Parks and Wildlife Service (NPWS). This list includes all wild birds along with their nests and eggs. Intentional destruction of an active nest from the building stage up until the chicks have fledged is an offence. This includes the cutting of hedgerows from the 1st of March to the 31st of August. The act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs). The Wildlife Amendment Act 2000 widened the scope of the Act to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

The current list of plant species protected by Section 21 of the Wildlife Act, 1976 (and amendments) is set out in the Flora (Protection) Order, 2015 (S.I. No. 356/2015). The Flora (Protection) Order affords protection to several species of plant in Ireland, including 68 vascular plants, 40 mosses, 25 liverworts, 1 stonewort and 1 lichen. This Act makes it illegal for anyone to uproot, cut or damage any of the listed plant species and it also forbids anyone from altering, interfering, or damaging their habitats. This protection is not confined to within designated conservation sites and applies wherever the plants are found.

EU Habitats Directive 1992 and EC (Birds and Natural Habitats) Regulations 2011

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992) provides protection to particular species and habitats throughout Europe. The Habitats Directive has been transposed into Irish law through the EC (Birds and Natural Habitats) Regulations 2011.

Annex IV of the EU Habitats Directive provides protection to a number of listed species, wherever they occur. Under Regulation 23 of the Habitats Directive, any person who, in regard to the listed species, *"Deliberately captures or kills any specimen of these species in the wild, deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration, deliberately takes or destroys eggs from the wild or damages or destroys a breeding site or resting place of such an animal shall be guilty of an offence."*

Invasive Species Legislation

Certain plant species and their hybrids are listed as Invasive Alien Plant Species in Part 1 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011, as amended). In addition, soils and other material containing such invasive plant material, are classified in Part 3 of the Third Schedule as vector materials and are subject to the same strict legal controls.

Failure to comply with the legal requirements set down in this legislation can result in either civil or criminal prosecution, or both, with very severe penalties accruing. Convicted parties under the Act can be fined up to €500,000.00, jailed for up to 3 years, or both.

Extracts from the relevant sections of the regulations are reproduced below.

"49(2) Save in accordance with a licence granted [by the Department of Arts, Heritage and the Gaeltacht], any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in anyplace [a restricted non-native plant], shall be guilty of an offence.

49(3) ... it shall be a defence to a charge of committing an offence under paragraph (1) or (2) to prove that the accused took all reasonable steps and exercised all due diligence to avoid committing the offence.

50(1) Save in accordance with a licence, a person shall be guilty of an offence if he or she [...] offers or exposes for sale, transportation, distribution, introduction, or release—
(a) an animal or plant listed in Part 1 or Part 2 of the Third Schedule,
(b) anything from which an animal or plant referred to in subparagraph (a) can be reproduced or propagated, or
(c) a vector material listed in the Third Schedule, in any place in the State specified in the third column of the Third Schedule in relation to such an animal, plant or vector material."

National Biodiversity Action Plan 2023-2030

The National Biodiversity Plan (NBAP) 2023-2030, the fourth such plan for Ireland, captures the objectives, targets and actions for biodiversity that will be undertaken by a wide range of government, civil society and private sectors. Actions required to achieve the strategic objectives as well as the lead and key partners responsible for their implementation are set out for each of the objectives and their outcomes (Table A1).

Table A1: Objectives and targets of the National Biodiversity Action Plan 2023-2030.

Objective	Outcome
1: Adopt a Whole-of-Government, Whole-of-Society Approach to Biodiversity	1A. Governance structures and reporting outputs have improved.
	1B. Organisational capacity and resources for biodiversity have increased at all levels of Government.
	1C: Responsibility for biodiversity is shared across the whole of government.
	1D: Biodiversity initiatives are supported across the whole of society.
	1E. The legislative framework for biodiversity conservation is robust, clear and enforceable.
2: Meet Urgent Conservation and Restoration Needs	2A: The protection of existing designated areas and protected species is strengthened and conservation and restoration within the existing protected area network are enhanced.
	2B: Biodiversity and ecosystem services in the wider countryside are conserved and restored – agriculture & forestry.
	2C: Biodiversity and ecosystem services in the wider countryside are conserved and restored – peatlands & climate action.

	2D: Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored.
	2E: Genetic diversity of wild and domesticated species is safeguarded.
	2F: A National Restoration Plan is in place to contribute to the ambition of the EU Biodiversity Strategy 2030 and global restoration targets.
	2H: Invasive alien species (IAS) are controlled and managed on an all-island basis to reduce the harmful impact they have on biodiversity and measures are undertaken to tackle the introduction and spread of new IAS to the environment.
3. Secure Nature's Contribution to People	3A: Ireland's natural heritage and biocultural diversity is recognised, valued, enhanced and promoted in policy and practice.
	3B: The role of biodiversity in supporting wellbeing, livelihoods, enterprise and employment is recognised and enhanced.
	3C: Planning and development will facilitate and secure biodiversity's contributions to people.
4. Enhance the Evidence Base for Action on Biodiversity	4A: Research funding bodies will have an improved understanding of the research and skills required to address biodiversity research gaps.
	4B: Data relevant to biodiversity and ecosystems, including conservation needs, is widely accessible and standardised.
	4C: Long-term monitoring programmes are in place to guide conservation and restoration goals.
	4D: Ireland has prepared national assessments of ecosystem services.
5. Strengthen Ireland's Contribution to International Biodiversity Initiatives	5A: Science, policy and action on biodiversity conservation and restoration is effectively coordinated in an all-island approach.
	5B: Ireland takes action internationally to cooperate with other countries, sectors, disciplines and communities to address the biodiversity crisis.
	5C: Ireland enhances its contributions to the international biodiversity data drive.

Fingal County Development Plan

Policies and objectives of the Fingal County Development Plan (CDP) 2023-2029 that are of relevance to this Biodiversity Chapter are outlined below:

- **Policy GINHP5**: *"Develop the green infrastructure network to ensure the conservation and enhancement of biodiversity, including the protection of European Sites, the provision of accessible parks, open spaces and recreational facilities (including allotments and community gardens), the sustainable management of water, the maintenance of landscape character including historic landscape character and the protection and enhancement of archaeological and heritage landscapes."*

- **Objective GINHO2:** *"Reduce fragmentation and enhance the resilience of Fingal's green infrastructure network by strengthening ecological links between urban areas, Natura 2000 sites, proposed Natural Heritage Areas, parks and open spaces and the wider regional network by connecting all new developments into the wider green infrastructure network."*

- **Policy GINHP12:** *"Protect areas designated or proposed to be designated as Natura 2000 sites (i.e., Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, and Refuges for Fauna."*

- **Objective GINHO27:** *"Support the National Parks and Wildlife Service, in the maintenance and achievement of favourable conservation status for the habitats and species in Fingal by taking full account of the requirements of the Habitats and Birds Directives, in the performance of its functions."*

- **Objective GINHO28:** *"Ensure that development does not have a significant adverse impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Habitat Directive Annex I sites and Annex II species contained therein, and on rare and threatened species including those protected by law and their habitats."*

- **Policy GINHP17:** *"Strictly protect areas designated or proposed to be designated as Natura 2000 sites (i.e., Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); also known as European sites) including any areas that may be proposed for designation or designated during the lifetime of this Plan."*

- **Objective GINHO35:** *"In accordance with Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities 2010, any plans or projects that are likely to have a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects, are subject to a screening for Appropriate Assessment unless they are directly connected with or necessary to the management of a Natura 2000 site.*

- **Objective GINHO79:** *"Ensure that there is appropriate public access to the coast including the provision of coastal walkways and cycleways, while taking full account of the need to conserve and enhance the natural and cultural heritage of the coast and the need to avoid significant adverse impacts on European Sites and species protected by law, through Screening for Appropriate Assessment, and examine the designation of traditional walking routes thereto as public rights of way."*

- **Objective CMO43:** *"Ensure that all new roads and streets are designed to enhance insofar as feasible, the County's Green Infrastructure network by ensuring adequate replacement and additional planting of native species and pollinators and to ensure that SuDS approaches are used to treat surface water run-off."*

- **Objective GINHO3:** *"Make provision for biodiversity within public open space and include water sensitive design and management measures (including SuDS) as part of a sustainable approach to open space design and management."*

- **Objective GINHO12:** *"Ensure the provision of new green infrastructure addresses the requirements of functional flood storage, the sustainable management of coastal erosion, and links with provision for biodiversity, Sustainable Drainage Systems (SuDS) and provision for parks and open space wherever possible and appropriate."*

- **Objective GINHO15:** *"Limit surface water run-off from new developments through the use of appropriate Sustainable Urban Drainage Systems (SuDS) using nature-based solutions and ensure that SuDS is integrated into all new development in the County."*

- **Policy GINHP21**: *"Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/ or contribute to landscape character and ensure that proper provision is made for their protection and management in line with the adopted Forest of Fingal-A Tree Strategy for Fingal."*

- **Objective GINHO46**: *"Ensure adequate justification for tree removal in new developments and open space management and require documentation and recording of the reasons where tree felling is proposed and avoid removal of trees without justification."*

- **Objective IUO9:** *"Maintain and enhance existing surface water drainage systems in the County and to require SuDS in new developments where appropriate, as set out in the Greater Dublin Strategic Drainage Study (Vol 2: New Development) / Greater Dublin Regional Code of Practice for Drainage Works)."*

- **Objective IUO13:** *"Require that all surface water run-off from new / extended domestic driveways, repaired/ replacement driveways and vehicular entrances (where such development is not exempted from the requirement to obtain planning permission) is managed using SuDS, ensuring no increase in surface water discharges to the public drainage network."*

Fingal Biodiversity Action Plan

Fingal Biodiversity Action Plan (BAP) 2023-2030 is set out to protect and improve biodiversity through six topics:

- Delivery of the Ecological Network across Fingal;
- Building for Biodiversity and Managing Open Space for Biodiversity;
- Climate change Adaption and Mitigation;
- Agri Environment Schemes and Rewilding;
- Research & Monitoring; and
- Raising Awareness.

APPENDIX 11.2
VALUE OF ECOLOGICAL RESOURCES

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Appendix 11.2 – Value of Ecological Resources

The criteria outlined in the table below, taken from the Guidelines for Assessment of Ecological Impacts of National Road Schemes published by the NRA, were used for assigning value to designated sites, habitats and species within the Site of the Proposed Development and surrounding area.

Table B1. Description of values for ecological resources based on geographic hierarchy of importance (NRA, 2009b).

Importance	Criteria
International Importance	- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. - Proposed Special Protection Area (pSPA). - Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). - Features essential to maintaining the coherence of the Natura 2000 Network - Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive - Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). - World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). - Biosphere Reserve (UNESCO Man & The Biosphere Programme) - Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). - Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). - Biogenetic Reserve under the Council of Europe. - European Diploma Site under the Council of Europe. - Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	- Site designated or proposed as a Natural Heritage Area (NHA). - Statutory Nature Reserve. - Refuge for Fauna and Flora protected under the Wildlife Acts. - National Park. - Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. o Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive
County Importance	- Area of Special Amenity. - Area subject to a Tree Preservation Order. - Area of High Amenity, or equivalent, designated under the County Development Plan.

	- Resident or regularly occurring populations (assessed to be important at the County level) of the following:
	  o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	  o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
	  o Species protected under the Wildlife Acts; and/or
	  o Species listed on the relevant Red Data list.
	  o Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
	- County important populations of species; or viable areas of semi-natural habitats; or natural heritage features identified in the National or Local BAP; if this has been prepared.
	- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
	- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value)	- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
	- Resident or regularly occurring populations (assessed to be important at the Local level) of the following:
	  o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	  o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
	  o Species protected under the Wildlife Acts; and/or o
	  o Species listed on the relevant Red Data list.
	  o Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
	- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value)	- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; - Sites or features containing non-native species that is of some importance in maintaining habitat links.

APPENDIX 11.3
EPA IMPACT ASSESSMENT CRITERIA

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Appendix 11.3 – EPA Impact Assessment Criteria

In line with the draft EPA Guidelines (EPA 2022), the following terms are defined when evaluating and quantifying the quality, significance, extent/context, probability and duration/frequency of effects.

Table C1. Definition of quality, significance, extent/context, probability and duration/frequency of effects.

Term	Definition
Quality of Effects	
Positive	A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative/Adverse	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance).
Significance of Effects	
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics. No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
Extent and Context of Effects	
Extent	Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
Context	Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)

Probability of Effects	
Likely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and Frequency of Effects	
Momentary	Effects lasting from seconds to minutes.
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year.
Short-term	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years.
Reversible	Effects that can be undone, for example through remediation or restoration.
Frequency	Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

APPENDIX 11.4
NON-BREEDING (WINTER) BIRDS SURVEY RESULTS 2023/24

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Appendix 11.4 – Non-breeding (Winter) Bird Survey Results 2023/24

Table A. All bird species recorded during Winter Bird Surveys of the Site and adjacent land (2023/24).

Species	Scientific name	BoCCI Status	Dates	Activity
Blackbird	*Turdus merula*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common on the Site.
Black-headed Gull	*Larus ridibundus*	Green	19th Oct 2023 31st Oct 2023	In-flight over the Site during October surveys only.
Blue Tit	*Cyanistes caeruleus*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Very common, recorded on all dates.
Bullfinch	*Pyrrhula pyrrhula*	Green	28th Nov 2023	One female seen in the southwest corner of the Site in the dense hedgerow.
Buzzard	*Buteo buteo*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 28th Nov 2023 20th Dec 2023 25th Jan 2024 6th Feb 2024 19th Feb 2024	Regular earlier in the season, however, sightings became infrequent. A peak count was of two (including a very vocal first-winter bird).
Chaffinch	*Fringilla coelebs*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023	Common, but most sightings involved small flyover flocks.

Species	Scientific name	BoCCI Status	Dates	Activity
			18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	
Coal Tit	*Phylloscopus collybita*	Green	19th Oct 2023 31st Oct 2023 28th Nov 2023 18th Jan 2024 6th Feb 2024 19th Feb 2024	Most frequently seen in the tall trees to the east of the Site but also recorded in the treeline to the south of the Site.
Cormorant	*Phalacrocorax carbo*	Amber	20th Dec 2023	Flyover only
Curlew	*Numenius arquata*	Red	28th Nov 2023 18th Jan 2024	Flyovers only with a flock landing briefly on the golf course behind the Site and outside of the Site boundary.
Dunnock	*Prunella modularis*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common around the Site boundary.
Feral Pigeon	*Columba livia domestica*	Unclassified	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Flyovers only.
Goldcrest	*Regulus regulus*	Amber	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023	Recorded on all dates. Most frequently seen in the trees along the south of the Site boundary.

Species	Scientific name	BoCCI Status	Dates	Activity
			28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	
Goldfinch	*Carduelis carduelis*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common, as with the Chaffinch sightings, most records involved small flocks in fight over the Site.
Great Tit	*Parus major*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common.
Great Black-backed Gull	*Larus marinus*	Green	19th Oct 2023 31st Oct 2023 21st Nov 2023 18th Jan 2024 4th Mar 2024	Flyovers were recorded on a few dates. Ages ranged from first winter to adult.
Greenfinch	*Chloris chloris*	Amber	18th Jan 2024 19th Feb 2024	Inside the Site itself, only flyovers were noted, however, there was quite a lot of Greenfinch activity a little bit further down the golf course in the trees on either side of the fairway approx. here. 53.387944, -6.085750
Grey Heron	*Ardea cinerea*	Green	19th Oct 2023 31st Oct 2023 20th Dec 2023	A few flyovers, and two recorded on the Site on 20th December 2023 before being

Species	Scientific name	BoCCI Status	Dates	Activity
			25th Jan 2024	spooked by the surveyor and flew towards the coast.
Herring Gull	*Larus argentatus*	Amber	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Very common, by far the most common species in flight over the Site.
Hooded Crow	*Corvus cornix*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Present on all dates.
Jackdaw	*Corvus monedula*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Present on all dates, although sometimes only recorded in flight over the Site.
Long-tailed Tit	*Aegithalos caudatus*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024	Frequently recorded on the Site, usually involving small roving flocks, which worked their way around the Site boundary.

Species	Scientific name	BoCCI Status	Dates	Activity
			6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	
Magpie	*Pica pica*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common.
Mallard	*Anas platyrhynchos*	Amber	11th Mar 2024	A pair flew over the Site on one date.
Meadow Pipit	*Anthus pratensis*	Red	10th Nov 2023 21st Nov 2023 6th Feb 2024 4th Mar 2024	Flyovers only which are likely to be related to visible migration over the Site. For example, a flock of nine flew over heading east on the 4th of March.
Mistle Thrush	*Turdus viscivorus*	Green	21st Nov 2023 28th Nov 2023 25th Jan 2024 6th Feb 2024	Occasionally seen on the Site but very common on the golf course behind the Site.
Pied Wagtail	*Motacilla alba yarrelli*	Green	10th Nov 2023 6th Feb 2024	Infrequent sightings, all involving flyovers.
Raven	*Corvus corax*	Green	21st Nov 2023	Flyovers only.
Redwing	*Turdus iliacus*	Red	10th Nov 2023 11th Mar 2024	A couple of flyovers only.
Robin	*Erithacus rubecula*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Very common on the Site.
Rook	*Corvus frugilegus*	Green	19th Oct 2023 31st Oct 2023	Common, especially in flight over the Site.

Species	Scientific name	BoCCI Status	Dates	Activity
			10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	
Song Thrush	*Turdus philomelos*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Occasional sightings with some heard singing. There seemed to be a healthy population in the trees along the golf course to the south of the Site.
Sparrowhawk	*Accipiter nisus*	Green	6th Feb 2024	A very close flyby of a 2nd calendar year female.
Starling	*Sturnus vulgaris*	Amber	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Common, particularly in flight over the Site. Not recorded on January surveys.
Stock Dove	*Columba oenas*	Red	18th Jan 2024 6th Feb 2024	Only recorded in flight over the Site. However, a pair were showing signs of being on territory in the tall trees behind the Site within the golf course ca.100m south-west.
Woodpigeon	*Columba palumbus*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024	Very common over the Site.

Species	Scientific name	BoCCI Status	Dates	Activity
			19th Feb 2024 4th Mar 2024 11th Mar 2024	
Wren	*Troglodytes troglodytes*	Green	19th Oct 2023 31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	Very common, recorded on all dates.

Table B. All bird species recorded at Claremont Strand during Winter Bird Surveys 2023/24.

Species	Scientific name	BoCCI Status	Dates recorded	Activity
Black-headed Gull	*Larus ridibundus*	Amber	28th Nov 2023 20th Dec 2023 25th Jan 2024	2 on the strand 4 on the strand 12 on the strand
Brent Goose	*Branta bernicla hrota*	Amber	6th Feb 2024 11th Mar 2024	85 feeding around the spit to the eastern end of the strand. 6 flew east past the strand.
Cormorant	*Phalacrocorax carbo*	Amber	31st Oct 2023 10th Nov 2023 21st Nov 2023 11th Mar 2024	2 offshore 2 offshore 2 offshore 2 offshore
Curlew	*Numenius arquata*	Red	21st Nov 2023	1 feeding on the strand
Great Black-backed Gull	*Larus marinus*	Amber	10th Nov 2023 21st Nov 2023 28th Nov 2023 25th Jan 2024 6th Feb 2024 4th Mar 2024 11th Mar 2024	24 on the strand. 2 on the strand. 3 on the strand. 10 on the strand. 8 on the strand. 2 on the strand. 6 on the strand.
Great Crested Grebe	*Podiceps cristatus*	Amber	11th Mar 2024	One feeding close in offshore.
Great Northern Diver	*Gavia immer*	Amber	21st Nov 2023	Winter plumaged adult close in offshore.
Greenshank	*Tringa nebularia*	Green	21st Nov 2023 25th Jan 2024	2 roosting on the spit. Two feeding distantly on the strand.

Species	Scientific name	BoCCI Status	Dates recorded	Activity
			11th Mar 2024	One distantly on the strand and another on the spit.
Grey Heron	*Ardea cinerea*	Green	10th Nov 2023 21st Nov 2023 20th Dec 2023 18th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	All sightings related to birds roosting on the buildings just to the east of the strand.
Grey Wagtail	*Motacilla cinerea*	Red	11th Mar 2024	A pair feeding on the path immediately south of the strand
Herring Gull	*Larus argentatus*	Amber	31st Oct 2023 10th Nov 2023 21st Nov 2023 28th Nov 2023 20th Dec 2023 18th Jan 2024 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024 11th Mar 2024	12 on the strand. 200 on the strand. 12 on the strand 31 on the strand 15 on the strand 3 on the strand 80 on the strand 115 on the strand 86 on the strand. 53 on the strand 76 on the strand
Lesser Black-backed Gull	*Larus fuscus*	Amber	11th Mar 2024	Two adults on the strand were the first of the spring migrants.
Oystercatcher	*Haematopus ostralegus*	Red	10th Nov 2023 21st Nov 2023 25th Jan 2024 6th Feb 2024 19th Feb 2024 4th Mar 2024	14 on the strand. 3 on the strand 11 on the strand + one on the spit. 64 on the strand. 12 on the strand. 1 on the strand.
Red-throated Diver	*Gavia stellata*	Amber	31st Oct 2023	One adult in winter plumage offshore.
Sanderling	*Calidris alba*	Green	10th Nov 2023	6 on the strand
Shag	*Gulosus aristotelis*	Amber	21st Nov 2023 11th Mar 2024	One feeding close to shore on two dates.

Table C. Results of the flightline surveys conducted at the Site over Winter 2023/34

Species	Date	Number of birds	Direction	Time over Site (seconds)	Height (metres)
Grey Heron	19th Oct 2023	1	N/NW	8s	75-100m
Grey Heron	31st Oct 2023	1	W	9s	75-100m
Grey Heron	31st Oct 2023	1	W	15s	75-100m

Species	Date	Number of birds	Direction	Time over Site (seconds)	Height (metres)
Grey Heron	31st Oct 2023	1	W	10s	75-100m
Grey Heron	31st Oct 2023	1	W	15s	75-100m
Curlew	28th Nov 2023	21	S	10s	30m
Grey Heron	20th Dec 2023	1	N	12s	20m
Grey Heron	20th Dec 2023	2	NW	20s	15-20m
Cormorant	20th Dec 2023	1	W	20s	100m
Curlew	18th Jan 2024	2	N	5s	30m
Curlew	18th Jan 2024	32	S	25s	50m
Great black-backed gull	18th Jan 2024	1	SW	20s	50-70m
Grey Heron	25th Jan 2024	1	w	15	50m
Mallard	11th Mar 2024	2	NW	7s	30m

APPENDIX 11.5
BREEDING BIRD REPORT

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 11.5 – Breeding Bird Report

ALTEMAR

Marine & Environmental Consultancy

Breeding Bird Assessment for a proposed residential development at Deer Park, Howth, Co. Dublin

20th May 2024

Prepared by: Frank Spellman of Altemar Ltd.
On behalf of: GLL PRS Holdco Limited

Altemar Ltd., 50 Templecarrig Upper, Delgany, Co. Wicklow. 00-353-1-2010713. info@altemar.ie
Directors: Bryan Deegan and Sara Corcoran
Company No.427560 VAT No. 9649832U
www.altemar.ie

Document Control Sheet			
Client	GLL PRS Holdco Limited		
Project	Breeding bird assessment for a proposed residential development on lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin.		
Report	Breeding Bird Assessment		
Date	20th May 2024		
Version	Author	Reviewed	Date
Final	Frank Spellman	Bryan Deegan	20th May 2024

Contents

Summary

Structure:	There is a boundary wall along the northern and eastern boundaries of the survey area. Following assessment, this was determined to be of poor nesting value for breeding birds.
Location:	Howth Demesne, Deer Park, Howth, Co. Dublin
Bird species breeding:	Blue tit & magpie.
Proposed work:	Residential development.
Impact on breeding birds:	The survey area contains confirmed breeding habitat for two green-listed species: blue tit and magpie. Habitats of highest habitat value will be retained: hedgerows and tree lines along the west, south and east site boundaries, as well as standalone trees throughout. The impact is deemed to be minor adverse/short term/negative/not significant. Landscaping will provide additional nesting resource in the longer term.
Surveys by:	Frank Spellman.
Survey date:	6th, 21st & 31st July 2023.

Receiving Environment

Project description

The description of the proposed project is as follows:

*"**GLL PRS Holdco Limited** intends to apply to Fingal County Council for permission for a Large-scale Residential Development on lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin, with a total site area of approx. 1.5ha. The proposed application area is bounded to the north by Howth Road (R105), to the east by the access road leading to Howth Castle and Deer Park Golf Club, to the west by existing residential dwellings, and to the south by Deer Park Golf Course.*

The development will consist of:

I. two offset blocks ranging in height from 3-5 storeys providing 135 residential units comprising:

a) 63 one-bedroom units

b) 72 two-bedroom units;

II. a public open space area of 1,676 sq.m and communal open space with an area of 890 sq.m;

III. the provision of 63 surface car parking spaces, including 4 accessible parking spaces & 13 EV charging spaces, and 6 motorcycle spaces;

IV. the provision of 410 bicycle parking spaces, including 342 secure bicycle spaces and 68 visitor spaces;

V. partial demolition of 3 sections of the existing demesne northern boundary wall, which fronts Howth Road to facilitate vehicular access in the northwestern corner and two separate pedestrian/cyclist access points along the centre and eastern side of the northern boundary wall;

VI. Restoration and refurbishment of the remaining extant northern and eastern demesne boundary wall;

VII. undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipe around the site;

VIII. Works to facilitate bicycle infrastructure upgrades and services connections along Howth Road; and

ESB kiosks, rooftop solar photovoltaics, waste storage and plant rooms, drainage, bicycle storage areas, boundary treatment, public lighting, and all ancillary site and development works to enable the proposed development."

The proposed site outline, location, and tree constraints, impact and protection plans are demonstrated in figures 1 – 4.

Arborist

An Arboricultural Impact Assessment and Method Statements report has been prepared by John Morris Arboricultural Consultancy to accompany this planning application. The report summarises the Arboricultural characteristics of the subject site:

"The main arboricultural features of the site include a mature avenue of trees to the east located along the entrance road to Howth Castle (outside the application Site), and a younger woodland shelter belt to the south that forms a boundary between the Site and Deer Park Golf Course. A mature linear hedgerow wraps around the western boundary of the Site.

Those trees located on land east of the Site at Howth Castle comprise a mix of mature beech (Fagus sylvatica) and sycamore (Acer pseudoplatanus) with an understorey of ash (Fraxinus excelsior), elder (Sambucas nigra), holly (Ilex aquifolium) and laurel (Laurus sp.). These trees are located on land that is around 840mm above the Site beyond the stone boundary wall and have collectively been identified as an important mature arboricultural feature in the local landscape that offers high visual amenity, and a connection of the wider woodlands surrounding Howth Castle. The mature tree line is illustrated on an OSNI First Edition Black & White Map (1829-

1842) indicating some of trees may be over 150 years old, or that there has been continuous tree cover through natural regeneration for since at least 1842 (Figure 2).

The early mature shelter belt across the southern boundary of the Site comprises a mix of native species that include Scots pine (Pinus sylvestris), Downey birch (Betula pubescens), Silver birch (Betula pendula) and oak (Quercus petraea) with occasional beech. The absence of the trees on the aerial orthophotography Mapgenie Imagery taken in 1995 indicates these trees have been planted sometime in the last 28 years (Figure 3) and are likely to be around 30 years old.

The shelter belt along the northern boundary of the gold course has been densely planted to provide visual screening and shelter to the golf course and would benefit from thinning to allow those species of better quality to develop and attain full size and form of their species. As a collective group of native species trees, they offer ecological and biodiversity benefits that provide green connections to other tree and hedgerows in the local landscape. The trees are partially visible from beyond the site due to their elevated position in the local landscape.

To the immediate south along the edge of the shelter belt and running parallel to the Deer Park Golf Course fairway is a linear tree line of early mature alder (Alnus glutinous). To the west of the Site is a sparse and unmanaged hawthorn (Crataegus monogyna) hedgerow with gaps that separates the Site from residential dwellings to the west and provides a degree of immediate mature screening to the Site and neighbouring properties."

This report also outlines the following arboricultural impact of the proposed development:

"The proposal will require the removal of one early mature sycamore (T68) for an access road and underground attenuation, and one semi-mature Rowan (T2) to allow sightlines into Howth Road/R105. A total of 89m² of semi-mature silver birch (G104) and 5no. semi mature Scots pine (G103) will require removal to facilitate accommodation Block D (see summary below).

Chart 1 summarises the combined total number of trees, groups and hedgerows proposed for removal by BS5837 retention category, to facilitate the proposal.

Chart 2 summarises the combined total number of trees, groups and hedgerows proposed for removal by age class, to facilitate the proposal.

The trees to be removed are illustrated on the Tree Impact & Protection Plan attached to this report, by a shaded red canopy.

Details for each tree or group can also be found in the Tree Schedule attached to this report.

A total of three trees (T4, T5 & T17) are recommended for removal irrespective of the proposal because they are growing from the base of the stone boundary wall and are likely to cause future structural damage to the wall."

The proposed tree constraints plan, and impact and protection plan, are demonstrated in figures 3 – 4.

Figure 1. *Survey area: red line and ownership boundaries.*

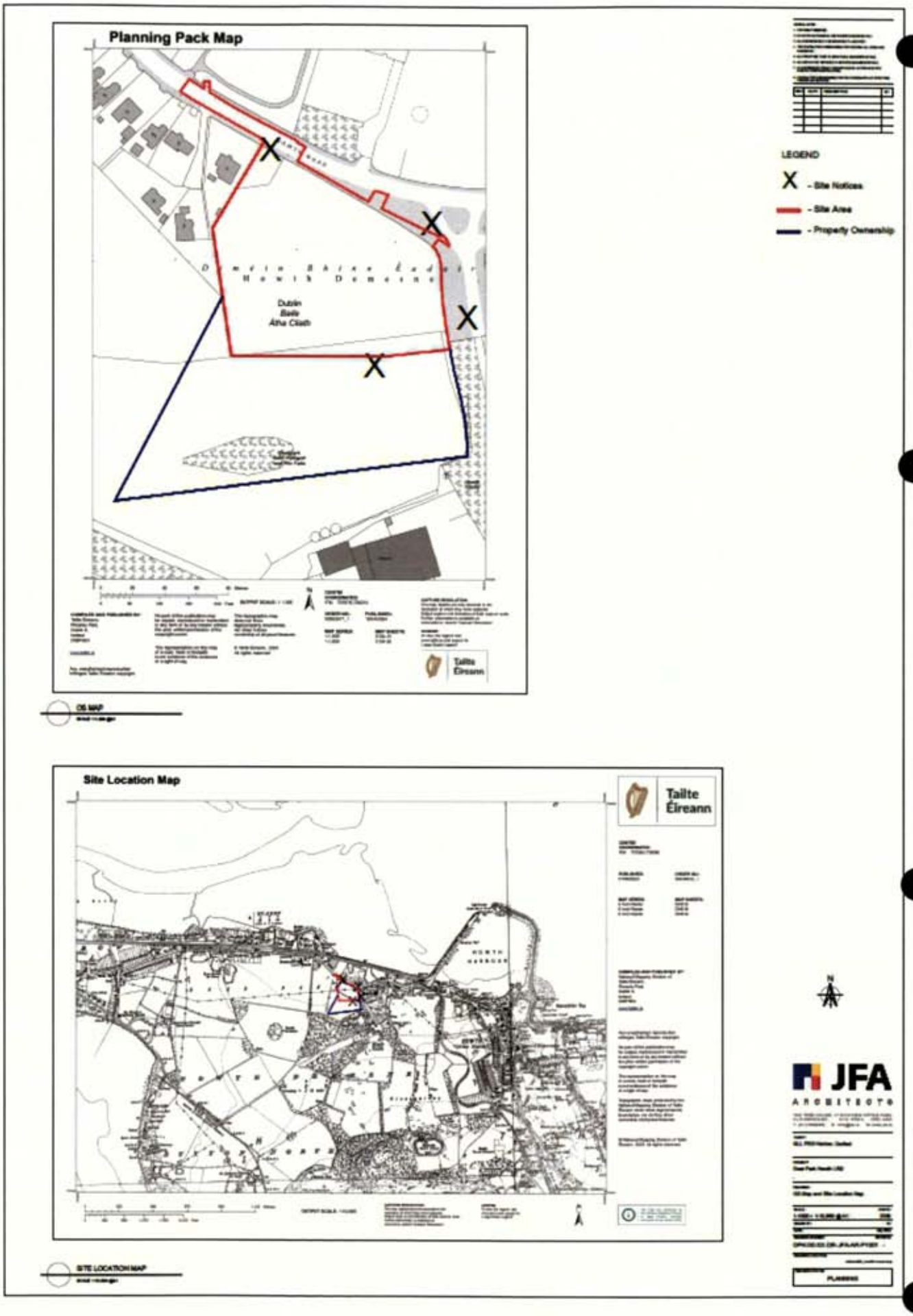


Figure 2. *OS map and site location map.*

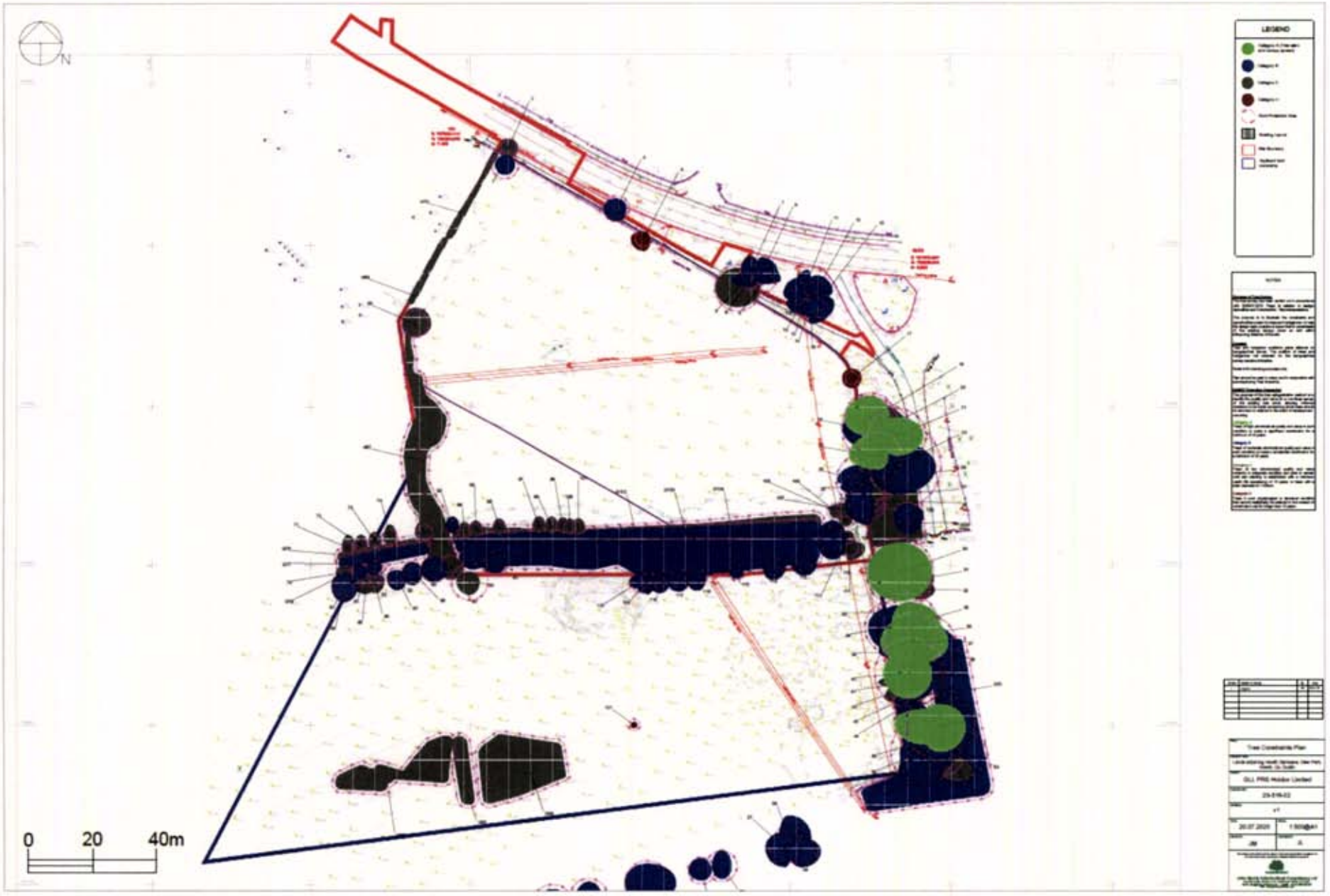
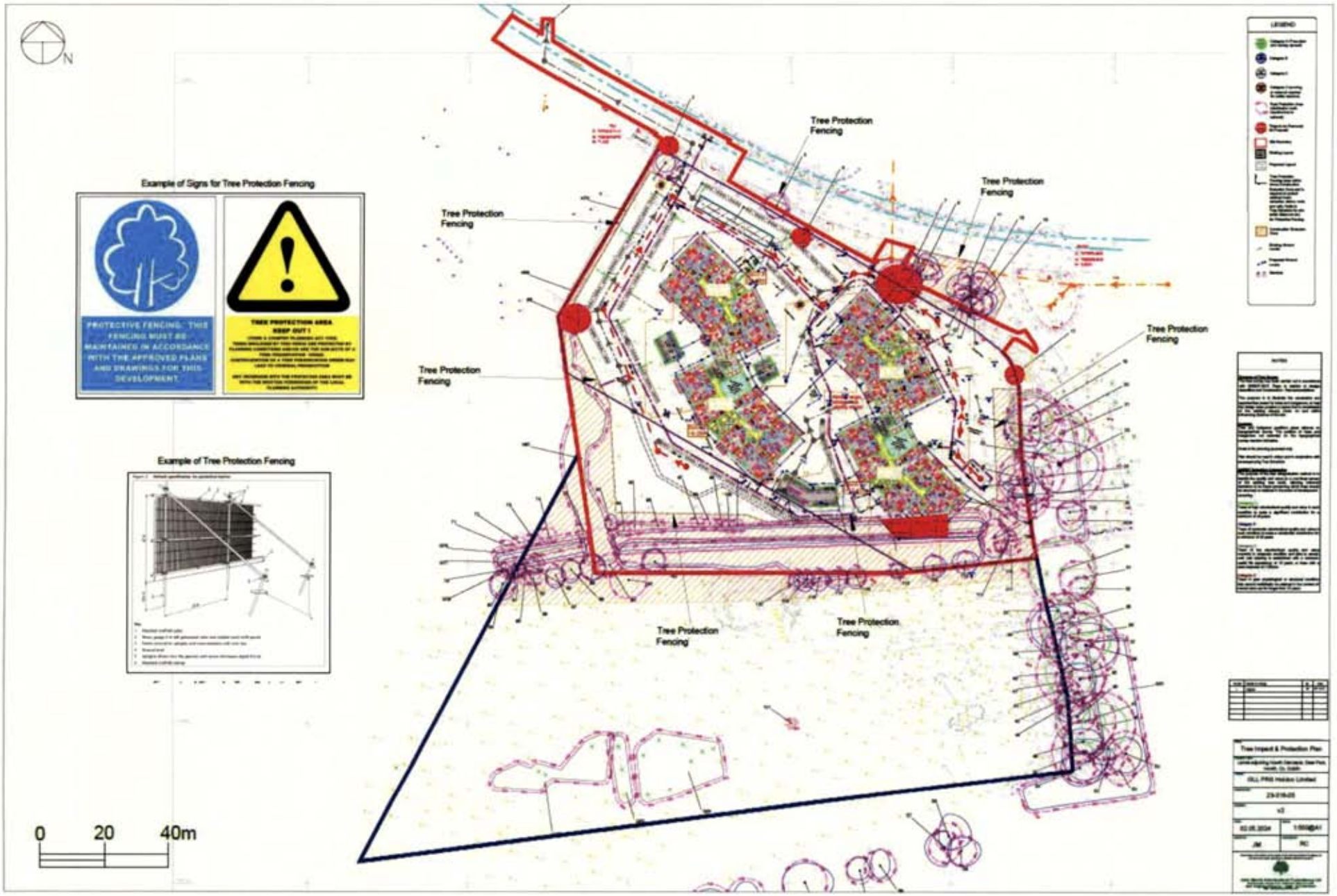


Figure 3. *Tree constraints plan.*



ure 4. Tree impact and protection plan (red=rem & orange=protected)

Competency of Assessor

This report has been prepared by Frank Spellman (BSc, MSc). Frank has previous experience in carrying out a wide range of bird surveys as both a sub-contractor and employee for consultancies in Ireland. These include both breeding and wintering surveys around Ireland covering a wide range of habitats and species. Frank has also carried out ornithological surveys for the US Forest Service in Juneau, Alaska, involving the identification of new Arctic tern breeding sites, egg/chick counts, and chick mortality/foraged fish sampling, as well as hummingbird banding. The desk and field surveys were carried out having regard to the guidance: 'Bird Survey Guidelines for assessing ecological impacts' (2023), as well as BTO Common Bird Census (Bibby *et al.*, 2000 and Gilbert *et al.*, 1998) and following CIEEM guidelines.

Legislative Context

The Wildlife Act 1976 protects wild birds in Ireland. Based on this legislation it is an offence to wilfully interfere with or destroy wild birds and their nests and eggs (other than the wild species mentioned in the Third Schedule of this Act). Under this legislation it is an offence for any person who *"wilfully takes or removes the eggs or nest of a protected wild bird otherwise than under and in accordance with such a licence, wilfully destroys, injures or mutilates the eggs or nest of a protected wild bird, wilfully disturbs a protected wild bird on or near a nest containing eggs or unflown young."*

Habitats Directive- Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora has been transposed into Irish Law, including, via, *inter alia*, the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

Council Directive 2009/147/EC 2010 on the conservation of wild birds provides for the conservation of wild birds by, among other things, classifying important ornithological sites as Special Protection Areas. The Directive relates to the conservation of all species of naturally occurring birds in the wild state, their eggs, nests and habitats in the European territory of the Member States. The Directive prohibits in particular:

- deliberate killing or capture by any method;
- deliberate destruction of, or damage to, their nests and eggs or removal of their nests;
- taking their eggs in the wild and keeping these eggs even if empty;
- deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive;
- keeping birds of species the hunting and capture of which is prohibited.

Under the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule:

- deliberately captures or kills any specimen of these species in the wild,
- deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,
- deliberately takes or destroys eggs of those species from the wild,
- damages or destroys a breeding site or resting place of such an animal, or
- keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive, shall be guilty of an offence.

Breeding bird survey

This report presents the results of three site visits by Frank Spellman on the 6th, 21st & 31st July 2023. A breeding bird transect survey was carried out on each occasion.

Survey methodology

This Breeding bird survey was carried out based on the BTO Common Bird Census (Bibby *et al.*, 2000 and Gilbert *et al.*, 1998) and following CIEEM guidelines.

A 15-minute settlement period was given following arrival to allow resumption of bird activity after any possible disturbance caused by arrival to the site. Various features such as hedgerows, tree lines, grasslands throughout, a single transect following the full perimeter of the site outline and ownership boundary was carried out, covering all areas and features available for breeding activity within and adjacent to the survey area. Each survey was carried out by a single surveyor.

The transect began in the south of the site on the southern end of the adjacent fairway, taking an anti-clockwise direction, following the contours of hedgerows/tree lines along the outer perimeter, while further circumnavigating features such as woods, trees, tree lines, scrub, and hedgerows. Movements were carried out slowly, with pauses every few meters as appropriate to identify and locate birds through movements & calls, continuing once all birds within an area/feature had been recorded. The transect took 1-2 hours to complete, ending once the transect was completed. Care was taken not to double count any observations. One dawn and two dusk surveys were carried out to account for varying activity levels between species.

Survey Results

Habitats of breeding bird potential

A desk and ground level breeding habitat assessment were carried and used to examine the structures and vegetation on site for features that could provide breeding habitat. Potential nesting features include heavy ivy growth, tree canopies, scrub, hedgerows, grassland, buildings/sheds with openings, rooftops etc. All vegetated areas and man-made structures on site were assessed for breeding bird potential.

Areas of high breeding bird potential included the treelines and hedgerows throughout the site and its boundaries, and scrub and long grass within the grassland to the north of the golf course.

Breeding activity survey

A total of 12 species were recorded on site across three surveys (see appendix 1 for individual observations). Two of these species were confirmed breeding during at least one survey.

Two amber-listed bird species of conservation concern were recorded on site: herring gull and swallow. Both species were observed taking flight paths across the site, neither of which landed or persisted over the site for the purpose of foraging, resting, or breeding.

Two red listed bird species of conservation concern were recorded in flight over the site: curlew and swift.

Breeding activity was confirmed for two green-listed species: blue tit and magpie. A blue tit pair showed persisted breeding behaviour within the hedgerow along the western boundary between the central tree line and housing to the northwest on 6th July. An active magpie nesting site was observed during the same survey within a sycamore tree emerging from the same hedgerow approximately 20 m north of the observed blue tit breeding location towards the residential housing.

No amber listed species of conservation concern in Ireland were observed breeding on site. No red listed species of conservation concern in Ireland were observed breeding on site.

Table 1. *Species confirmed breeding on site.*

Common name	BTO	Latin name	BoCCI
Blue Tit	BT	*Cyanistes caeruleus*	Green
Magpie	MG	*Pica pica*	Green

Figure 5: *Bird breeding locations indicated by crosses coloured according to BoCCI status.*

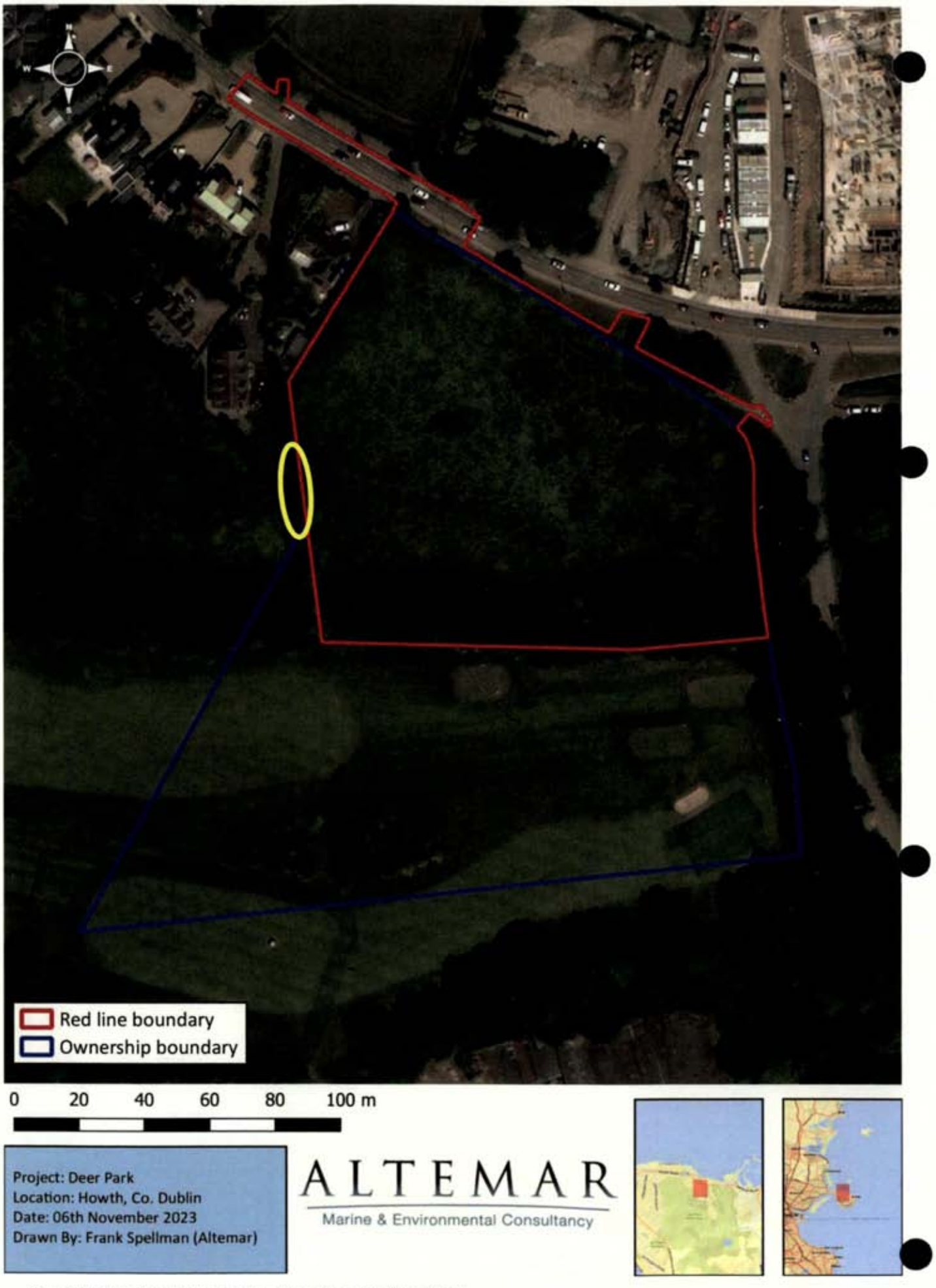


Figure 6: *Breeding hotspot areas for all species (in yellow).*

Breeding Bird Assessment Findings

Review of local bird records

The review of existing bird records (sourced from NBDC Database) within a 2 km² grid (Reference grid O23U) encompassing the study area reveals that 71 known bird species have been observed locally, of which 23 are currently amber and 8 are red listed BoCCI (*Table 2*).

***Table 2:** Status of bird species within 2 km² (grid O23U)*

Species Name	Record Count	Date of Last Record	BoCCI Status
Arctic Tern (Sterna paradisaea)	1	24/05/2014	Amber
Barn Swallow (Hirundo rustica)	5	23/05/2014	Amber
Bar-tailed Godwit (Limosa lapponica)	1	13/01/2018	Red
Black-billed Magpie (Pica pica)	7	24/05/2014	Green
Blackcap (Sylvia atricapilla)	3	23/05/2014	Green
Blue Tit (Cyanistes caeruleus)	5	24/05/2014	Green
Branta bernicla subsp. hrota	1	31/12/2011	Amber
Brent Goose (Branta bernicla)	2	31/12/2011	Amber
Chaffinch (Fringilla coelebs)	5	23/05/2014	Green
Coal Tit (Periparus ater)	6	17/02/2023	Green
Common Blackbird (Turdus merula)	5	23/05/2014	Green
Common Bullfinch (Pyrrhula pyrrhula)	5	12/01/2017	Green
Common Buzzard (Buteo buteo)	1	26/01/2018	Green
Common Chiffchaff (Phylloscopus collybita)	4	24/05/2014	Green
Common Greenshank (Tringa nebularia)	1	13/01/2018	Green
Common Guillemot (Uria aalge)	1	24/05/2014	Amber
Common Kestrel (Falco tinnunculus)	1	31/12/2011	Red
Common Linnet (Carduelis cannabina)	2	24/05/2014	Amber
Common Moorhen (Gallinula chloropus)	3	23/05/2014	Green
Common Pheasant (Phasianus colchicus)	2	23/05/2014	Green
Common Shelduck (Tadorna tadorna)	1	24/05/2014	Amber
Common Starling (Sturnus vulgaris)	2	31/12/2011	Amber
Common Swift (Apus apus)	2	24/05/2014	Red
Common Tern (Sterna hirundo)	1	24/05/2014	Amber
Common Whitethroat (Sylvia communis)	1	31/07/1991	Green
Common Wood Pigeon (Columba palumbus)	5	24/05/2014	Green
Eurasian Collared Dove (Streptopelia decaocto)	2	24/05/2014	Green
Eurasian Curlew (Numenius arquata)	2	03/03/2014	Red
Eurasian Jackdaw (Corvus monedula)	5	23/05/2014	Green
Eurasian Oystercatcher (Haematopus ostralegus)	4	24/05/2014	Red
Eurasian Sparrowhawk (Accipiter nisus)	3	24/05/2014	Green
Eurasian Treecreeper (Certhia familiaris)	3	23/05/2014	Green
European Bee-eater (Merops apiaster)	1	15/05/1961	n/a

European Goldfinch (Carduelis carduelis)	4	23/05/2014	Green
European Greenfinch (Carduelis chloris)	4	24/05/2014	Amber
European Robin (Erithacus rubecula)	8	24/05/2014	Green
Goldcrest (Regulus regulus)	4	23/05/2014	Amber
Great Black-backed Gull (Larus marinus)	2	24/05/2014	Green
Great Spotted Woodpecker (Dendrocopos major)	2	26/11/2007	Green
Great Tit (Parus major)	4	23/05/2014	Green
Grey Heron (Ardea cinerea)	3	23/05/2014	Green
Hedge Accentor (Prunella modularis)	4	24/05/2014	Green
Herring Gull (Larus argentatus)	3	24/05/2014	Amber
Hooded Crow (Corvus cornix)	6	23/05/2014	Green
House Martin (Delichon urbicum)	2	23/05/2014	Amber
House Sparrow (Passer domesticus)	1	31/07/1991	Amber
Little Egret (Egretta garzetta)	1	24/05/2014	Green
Long-tailed Tit (Aegithalos caudatus)	1	31/12/2011	Green
Mallard (Anas platyrhynchos)	2	23/05/2014	Amber
Meadow Pipit (Anthus pratensis)	1	31/07/1991	Red
Mistle Thrush (Turdus viscivorus)	5	23/05/2014	Green
Northern Gannet (Morus bassanus)	1	30/12/2022	Amber
Peregrine Falcon (Falco peregrinus)	2	24/05/2014	Green
Red-backed Shrike (Lanius collurio)	1	26/05/2012	Green
Redwing (Turdus iliacus)	1	31/12/2011	Red
Reed Bunting (Emberiza schoeniclus)	1	24/05/2014	Green
Ringed Plover (Charadrius hiaticula)	1	31/07/1991	Amber
Rock Pigeon (Columba livia)	4	23/05/2014	Green
Rook (Corvus frugilegus)	6	24/05/2014	Green
Ruddy Turnstone (Arenaria interpres)	1	16/01/2016	Amber
Sand Martin (Riparia riparia)	1	24/05/2014	Amber
Sandwich Tern (Sterna sandvicensis)	1	24/05/2014	Amber
Sky Lark (Alauda arvensis)	1	31/12/2011	Amber
Song Thrush (Turdus philomelos)	5	23/05/2014	Green
Spotted Flycatcher (Muscicapa striata)	1	31/07/1991	Amber
Stock Pigeon (Columba oenas)	2	31/12/2011	Red
Stonechat (Saxicola torquata)	2	24/05/2014	Green
Whimbrel (Numenius phaeopus)	1	13/01/2018	Green
White Wagtail (Motacilla alba)	3	31/12/2011	Green
Willow Warbler (Phylloscopus trochilus)	2	31/12/2011	Amber
Winter Wren (Troglodytes troglodytes)	7	24/05/2014	Green

Mitigation

In the interest of preserving both confirmed and potential breeding bird habitat on site, the following mitigation measures will be applied.

- The hedgerow/tree line along the western boundary of the site dividing the proposed development from an adjacent residential area will be retained.
- As there is precedence for over 71 species historically recorded in the surrounding area (23 amber & 8 red BoCCI), trees and tree lines along the northern, eastern and southern red line boundary, as well scrub/hedgerow along the west of the site boundary, shall be retained due to their potential as breeding habitat.
- A tree protection plan will be in operation during the construction phase.
- Any works involving removal of vegetation on site shall be undertaken outside of the breeding bird season (March-July).
- Where any habitats such as hedgerows, standalone trees, tree lines and woodlands must be removed, replacement habitats will be incorporated into the landscape design for the proposed development using similar plant species to those removed and/or native species. However, retention of existing habitats is the preferred option.
- Fifteen bird boxes will be places on site as an enhancement measure.

Conclusion

Three breeding bird surveys were carried out at this site. The bird surveys comply with bird survey guidance documentation including BTO Common Bird Census (Bibby *et al.*, 2000 and Gilbert *et al.*, 1998) and following CIEEM guidelines. Weather conditions were favourable on each occasion.

A total of 12 species were recorded on site across three surveys (see appendix 1 for individual observations). Two of these species were confirmed breeding during at least one survey.

Breeding activity was confirmed for two green-listed species: blue tit and magpie. A blue tit pair showed persisted breeding behaviour within the hedgerow along the western boundary between the central tree line and housing to the northwest on 6th July. An active magpie nesting site was observed during the same survey within a sycamore tree emerging from the same hedgerow approximately 20 m north of the observed blue tit breeding location towards the residential housing.

The hotspot of breeding activity observed on site (*Figure 3.*) was hedgerow/tree line along the western boundary of the site dividing the proposed development from an adjacent residential area. To mitigate the impact of this development on breeding birds, the hedgerow/tree line along the eastern, southern, and western site boundary, as well as a number of standalone trees throughout, will be retained.

References

Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. (2000) Bird Census Techniques. Academic Press, London

Bird Survey & Assessment Steering Group. (2022). Bird Survey Guidelines for assessing ecological impacts, v.1.0.0. https://birdsurveyguidelines.org [15/05/2023]

Chartered Institute of Ecology and Environmental Management (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine.* Chartered Institute of Ecology and Environmental Management, Winchester.

Collated by the National Biodiversity Data Centre from different sources, General Biodiversity Records from Ireland, National Biodiversity Data Centre, Ireland, accessed 17 October 2023, <https://maps.biodiversityireland.ie/Dataset/7>

Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1982

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979

Department of Housing, Planning and Local Government (December, 2018). *Urban Development and Building Heights Guidelines for Planning Authorities*.

EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive) 1992

EU Directive on the Conservation of Wild Birds 2009

Gilbert, G., Gibbons, D.W., & Evans, J. (1998) Bird Monitoring Methods: A Manual of Techniques for UK Key Species. The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.

Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

Wildlife Act 1976 and Wildlife [Amendment] Act 2000. Government of Ireland.

Appendix

Table 1: Individual observations recorded (breeding observations in yellow)

Date	Time	Species	No.	Behaviour	Details
06/07/2023	05:54	Herring Gull	1	Flight Path	Westerly flight path across northern site boundary.
06/07/2023	06:19	Woodpigeon	1	Flight Path	Southerly flight path across southwestern corner of ownership boundary.
06/07/2023	06:25	Swift	2	Foraging	Foraging on the wing over centre of site, over and either side of central hedgerow along golf course border.
06/07/2023	06:49	Herring Gull	1	Flight Path	Easterly flight path over red line and ownership boundary.
06/07/2023	06:51	Curlew	1	Flight Path	Northerly flight path across golf course and southern end of red line boundary.
06/07/2023	06:58	Blue Tit	2	Breeding	Blue Tit pair exhibiting breeding behaviour within hedgerow along western red line boundary.
06/07/2023	07:00	Coal Tit	1	Foraging	Foraging amongst hedgerow along western red line boundary.
06/07/2023	07:01	Woodpigeon	1	Flight Path	Westerly flight path across centre of red line boundary area.
06/07/2023	07:02	Herring Gull	1	Flight Path	Easterly flight path across Northwest of red line boundary.
06/07/2023	07:04	Blackbird	1	Flight Path	Southerly flight path across Western end of red line boundary area.
06/07/2023	07:05	Magpie	1	Foraging	Foraging within hedgerow at northwestern corner of red line boundary.
06/07/2023	07:09	Jackdaw	1	Flight Path	Westerly flight through centre of red line area.
06/07/2023	07:13	Blackbird	1	Foraging	Foraging within treeline dividing field from golf course at Eastern end of site.
06/07/2023	07:16	Woodpigeon	1	Perching	Perched in treeline at western corner of red line boundary.
06/07/2023	07:17	Magpie	2	Breeding	Sycamore tree along western boundary of red line area.
06/07/2023	07:21	Swallow	2	Foraging	On the wing over most of golf course area within ownership and red line boundary.
06/07/2023	07:22	Woodpigeon	2	Flight Path	Easterly flight path over golf course.
21/07/2023	22:06	Heron	1	Flight path	Westerly across southeastern corner of site.
21/07/2023	22:50	Blackbird	1	Calling	Within hedgerow running west-east through centre of site.
31/07/2023	21:07	Heron	1	Flight path	Northeasterly flight path across eastern portion of site.
31/07/2023	21:32	Chiffchaff	1	Flight path	Southerly flight path across centre of site.
31/07/2023	21:46	Herring Gull	1	Flight path	Northerly flight path across centre of site.

APPENDIX 11.6
BAT REPORT

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 11.6 – Bat Report

ALTEMAR

Marine & Environmental Consultancy

Bat Fauna Impact Assessment for a proposed residential development at Deer Park, Howth, Co. Dublin

20th May 2024

Prepared by: Bryan Deegan of Altemar Ltd.
On behalf of: GLL PRS Holdco Limited

Altemar Ltd., 50 Templecarrig Upper, Delgany, Co. Wicklow. 00-353-1-2010713. info@altemar.ie
Directors: Bryan Deegan and Sara Corcoran
Company No.427560 VAT No. 9649832U
www.altemar.ie

Document Control Sheet			
Client	GLL PRS Holdco Limited		
Project	Bat fauna impact assessment for a large-scale residential development on lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin.		
Report	Bat Fauna Assessment		
Date	20th May 2024		
Version	Author	Reviewed	Date
Final	Bryan Deegan	Gayle O'Farrell	20th May 2024

Contents

Summary

Structure:	There is a boundary wall along the northern and eastern boundaries of the survey area. Following assessment, this was determined to be of poor roosting value.
Location:	Howth Demesne, Deer Park, Howth, Co. Dublin
Bat species present:	An individual Soprano pipistrelle (*Pipistrellus pygmaeus*) was observed emerging from eastern tree line (trees on opposite site of eastern boundary wall) in 2019, 2023 and 2024. Foraging of an individual Soprano pipistrelle (*Pipistrellus pygmaeus*) was noted during all surveys. A single Leisler's Bat (*Nyctalus leisleri*) was noted foraging along the southwestern and southeastern boundary of the subject site in 2024.
Proposed work:	Residential development.
Impact on bats:	Existing lighting is observed from the road to the north of the site. This lighting contributes to spill into the proposed development site. The removal of trees and the increase in lighting on site will result in a low adverse effect on bat foraging. Minor foraging on site was detected and is deemed to be of low foraging importance to bats in the surrounding area. As there was no bat roost onsite a NPWS derogation licence is not required for the removal of trees. No trees of bat roosting potential are to be removed. Based on the limited amount of bat activity and the current light spill into the site, the proposed development of this site it will not have any significant effect on local bat populations, and that any such effect will be only minor adverse at the local level. No bat roosts or potential bat roosts will be lost due to this development and the species expected to occur onsite should persist. In the absence of a sensitive lighting strategy trees that may form bat roosts adjacent to the eastern site boundary may be negatively affected by light spill. However, following mitigation within the lighting strategy to reduce light spill and intensity, the species expected to occur onsite and in the surrounding area should persist.
Survey by:	Bryan Deegan (MCIEEM)
Survey date:	2nd October 2019, 20th July 2023 and 19th May 2024

Receiving Environment

Background

*"**GLL PRS Holdco Limited** intends to apply to Fingal County Council for permission for a Large-scale Residential Development on lands adjoining Howth Demesne, Deer Park, Howth, Co. Dublin, with a total site area of approx. 1.5ha. The proposed application area is bounded to the north by Howth Road (R105), to the east by the access road leading to Howth Castle and Deer Park Golf Club, to the west by existing residential dwellings, and to the south by Deer Park Golf Course.*

The development will consist of:

I. *two offset blocks ranging in height from 3-5 storeys providing 135 residential units comprising:*
   a) *63 one-bedroom units*
   b) *72 two-bedroom units;*

II. *a public open space area of 1,676 sq.m and communal open space with an area of 890 sq.m;*

III. *the provision of 63 surface car parking spaces, including 4 accessible parking spaces & 13 EV charging spaces, and 6 motorcycle spaces;*

IV. *the provision of 410 bicycle parking spaces, including 342 secure bicycle spaces and 68 visitor spaces;*

V. *partial demolition of 3 sections of the existing demesne northern boundary wall, which fronts Howth Road to facilitate vehicular access in the northwestern corner and two separate pedestrian/cyclist access points along the centre and eastern side of the northern boundary wall;*

VI. *Restoration and refurbishment of the remaining extant northern and eastern demesne boundary wall;*

VII. *undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipe around the site;*

VIII. *Works to facilitate bicycle infrastructure upgrades and services connections along Howth Road; and*

ESB kiosks, rooftop solar photovoltaics, waste storage and plant rooms, drainage, bicycle storage areas, boundary treatment, public lighting, and all ancillary site and development works to enable the proposed development."

The proposed site outline, location, and tree constraints, impact and protection plans are demonstrated in figures 1 – 4.

Lighting

A Public Lighting Report has been prepared by IN2 Engineering Design Partnership to accompany this planning application. This report states that the lighting is compliant with bat lighting guidelines and outlines the following public lighting design for the proposed development:

Roadways

'The Private Residential Roadways have been assessed as a P3 Lighting Class as recommended standards in BS 8300-1:2018 for both maintained average and minimum lux level as per Table 2.2 in this report. The adjacent footpaths have been assessed as P4 lighting class.

The proposed lighting design utilises CU Phosco LED fittings mounted on 6m columns, further details in section 6.0. These fittings are from the approved lighting manufacturers in Fingal County Council Public Lighting Guidelines 2017.'

Residential circulation and amenity areas

'The Private residential and circulation amenity areas have been assessed as a P4 Lighting Class based on the requirements detailed in Fingal County Council Public Lighting Guidelines 2017.

The proposed lighting design utilises CU Phosco LED fittings mounted on 6m columns, and Arluce Zoya on 3.5m columns as main luminaires for circulation in private footpaths.' The Public lighting layout is demonstrated in figure 5.

Arborist

An Arboricultural Impact Assessment and Method Statements report has been prepared by John Morris Arboricultural Consultancy to accompany this planning application. The report summarises the Arboricultural characteristics of the subject site:

"The main arboricultural features of the site include a mature avenue of trees to the east located along the entrance road to Howth Castle (outside the application Site), and a younger woodland shelter belt to the south that forms a boundary between the Site and Deer Park Golf Course. A mature linear hedgerow wraps around the western boundary of the Site.

Those trees located on land east of the Site at Howth Castle comprise a mix of mature beech (Fagus sylvatica) and sycamore (Acer pseudoplatanus) with an understorey of ash (Fraxinus excelsior), elder (Sambucas nigra), holly (Ilex aquifolium) and laurel (Laurus sp.). These trees are located on land that is around 840mm above the Site beyond the stone boundary wall and have collectively been identified as an important mature arboricultural feature in the local landscape that offers high visual amenity, and a connection of the wider woodlands surrounding Howth Castle. The mature tree line is illustrated on an OSNI First Edition Black & White Map (1829-1842) indicating some of trees may be over 150 years old, or that there has been continuous tree cover through natural regeneration for since at least 1842 (Figure 2).

The early mature shelter belt across the southern boundary of the Site comprises a mix of native species that include Scots pine (Pinus sylvestris), Downey birch (Betula pubescens), Silver birch (Betula pendula) and oak (Quercus petraea) with occasional beech. The absence of the trees on the aerial orthophotography Mapgenie Imagery taken in 1995 indicates these trees have been planted sometime in the last 28 years (Figure 3) and are likely to be around 30 years old.

The shelter belt along the northern boundary of the gold course has been densely planted to provide visual screening and shelter to the golf course and would benefit from thinning to allow those species of better quality to develop and attain full size and form of their species. As a collective group of native species trees, they offer ecological and biodiversity benefits that provide green connections to other tree and hedgerows in the local landscape. The trees are partially visible from beyond the site due to their elevated position in the local landscape.

To the immediate south along the edge of the shelter belt and running parallel to the Deer Park Golf Course fairway is a linear tree line of early mature alder (Alnus glutinous). To the west of the Site is a sparse and unmanaged hawthorn (Crataegus monogyna) hedgerow with gaps that separates the Site from residential dwellings to the west and provides a degree of immediate mature screening to the Site and neighbouring properties."

This report also outlines the following arboricultural impact of the proposed development:

"The proposal will require the removal of one early mature sycamore (T68) for an access road and underground attenuation, and one semi-mature Rowan (T2) to allow sightlines into Howth Road/R105. A total of 89m² of semi-mature silver birch (G104) and 5no. semi mature Scots pine (G103) will require removal to facilitate accommodation Block D (see summary below).

Chart 1 summarises the combined total number of trees, groups and hedgerows proposed for removal by BS5837 retention category, to facilitate the proposal.

Chart 2 summarises the combined total number of trees, groups and hedgerows proposed for removal by age class, to facilitate the proposal.

The trees to be removed are illustrated on the Tree Impact & Protection Plan attached to this report, by a shaded red canopy.

Details for each tree or group can also be found in the Tree Schedule attached to this report.

A total of three trees (T4, T5 & T17) are recommended for removal irrespective of the proposal because they are growing from the base of the stone boundary wall and are likely to cause future structural damage to the wall."

The proposed tree constraints plan, and impact and protection plan, are demonstrated in figures 3 – 4.

Figure 1. *Proposed site outline and ownership boundary.*

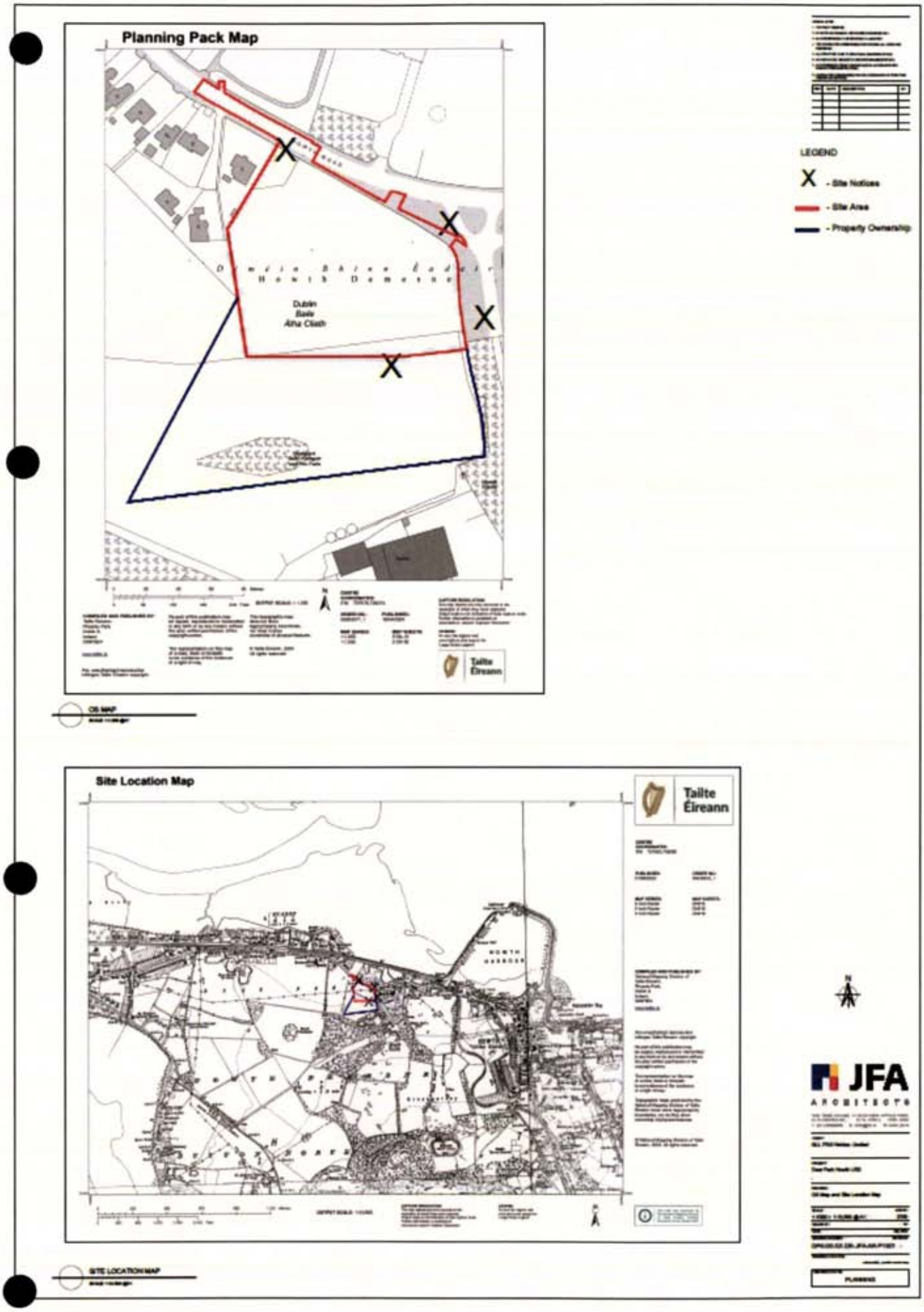


Figure 2. *OS map and site location map.*

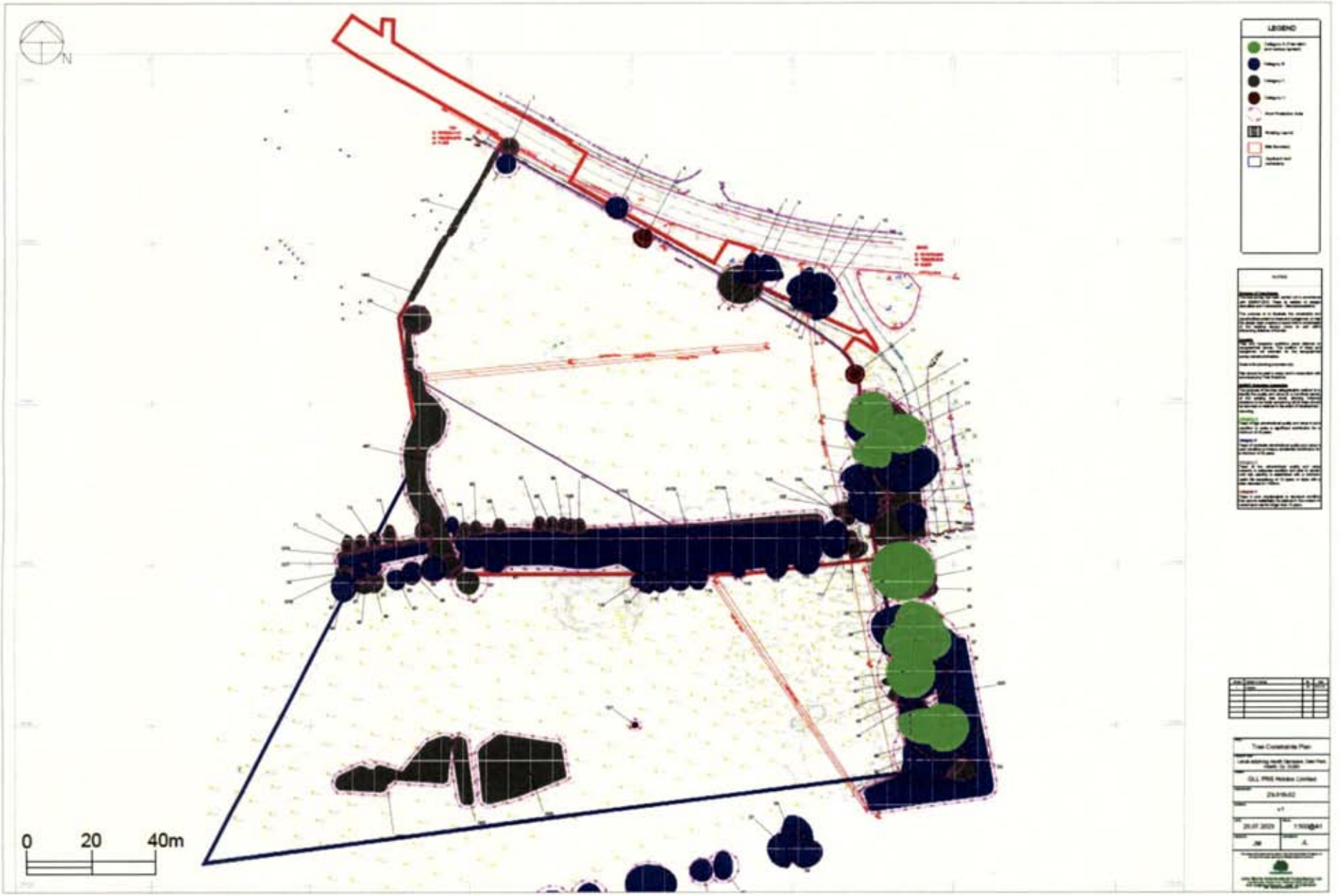


Figure 3. *Tree constraints plan.*

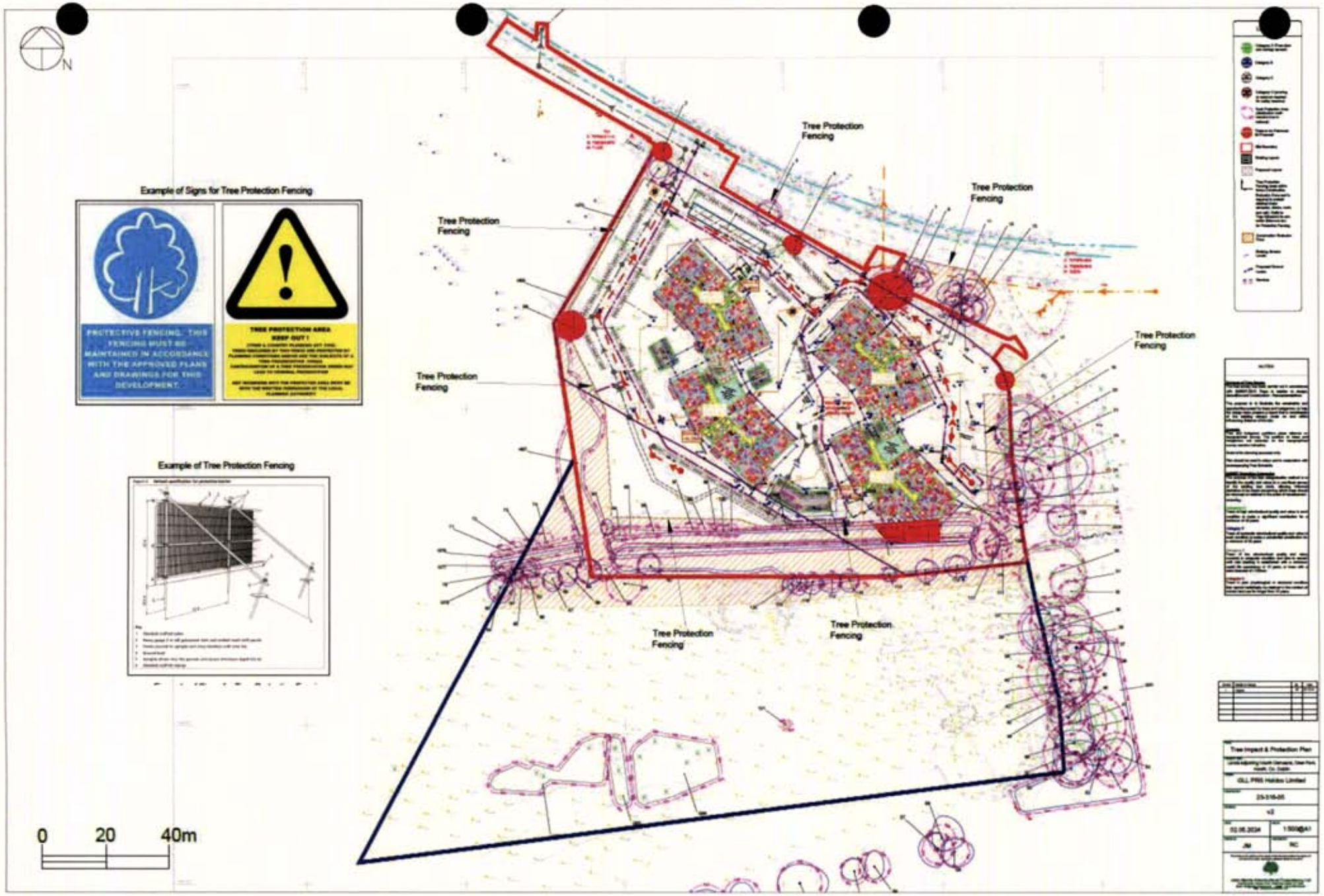


Figure 4. *Tree impact and protection plan. (red=removal & orange=protected)*

***Figure 5**: Site lighting layout*

Competency of Assessor

This report has been prepared by Bryan Deegan MSc, BSc (MCIEEM). Bryan has over 30 years of experience providing ecological consultancy services in Ireland. He has extensive experience in carrying out a wide range of bat surveys including dusk emergence, dawn re-entry and static detector surveys. He also has extensive experience reducing the potential impact of projects that involve external lighting on Bats. Bryan trained with Conor Kelleher author of the Bat Mitigation Guidelines for Ireland (Marnell et. al (2022)) and Bryan is currently providing bat ecology (impact assessment and enhancement) services to Dun Laoghaire Rathdown County Council primarily on the Shanganagh Park Masterplan. The desk and field surveys in 2023 and 2024 were carried out having regard to the guidance: Bat Surveys for Professional Ecologists – Good Practice Guidelines 3rd Edition (Collins, J. (Ed.) 2016) and Marnell *et al.* (2022), Bat Mitigation Guidelines for Ireland.

Legislative Context

Wildlife Act 1976 (as amended by, inter alia, the Wildlife (Amendment) Act 2000).

Bats in Ireland are protected by the Wildlife (Amendment) Act 2000. Based on this legislation it is an offence to wilfully interfere with or destroy the breeding or resting place of any species of bat. Under this legislation it is an offence to *"Intentionally kill, injure or take a bat, possess or control any live or dead specimen or anything derived from a bat, wilfully interfere with any structure or place used for breeding or resting by a bat, wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose. "*

Habitats Directive- Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora has been transposed into Irish Law, including, via, *inter alia*, the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). See Art.73 of the 2011 Regulations which revokes the 1997 Regulations.

Annex II of the Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) lists animal and plant species of Community interest, the conservation of which requires the designation of Special Areas of Conservation (SACs); Annex IV lists animal and plant species of Community interest in need of strict protection. All bat species in Ireland are listed on Annex IV of the Directive, while the Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is protected under Annex II which related to the designation of Special Areas of Conservation for a species.

Under the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), all bat species are listed under the First Schedule and, pursuant to, *inter alia*, Part 6 and Regulation 51, it is an offence to:

- Deliberately capture or kill a bat;
- Deliberately disturb a bat particularly during the period of breeding, hibernating or migrating;
- Damage or destroy a breeding site or resting place of a bat;
- Keep, sell, transport, exchange, offer for sale or offer for exchange any bat taken in the wild.

Bat survey

This report presents the results of a site visit by Bryan Deegan on the 2nd of October 2019, 20th July 2023 and 19th May 2024. Bat emergent and detector surveys were carried out. Trees on site were examined for bat roosting potential.

Survey methodology

As outlined in Marnell et al. 2022 *'The presence of a large maternity roost can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, most roosts are less obvious. A visit during the summer or autumn has the advantage that bats may be seen or heard. Buildings (which for this definition exclude cellars and other underground structures) are rarely used for hibernation alone, so droppings deposited by active bats provide the best clues. Roosts of species which habitually enter roof voids are probably the easiest to detect as the droppings will normally be readily visible. Roosts of crevice-dwelling species may require careful searching and, in some situations, the opening up of otherwise inaccessible areas. If this is not possible, best judgement*

might have to be used and a precautionary approach adopted. Roosts used by a small number of bats, as opposed to large maternity sites, can be particularly difficult to detect and may require extensive searching backed up by bat detector surveys (including static detectors) or emergence counts.' In relation to the factors influencing survey results the guidelines outlines the following *'During the winter, bats will move around to find sites that present the optimum environmental conditions for their age, sex and bodyweight and some species will only be found in underground sites when the weather is particularly cold. During the summer, bats may be reluctant to leave their roost during heavy rain or when the temperature is unseasonably low, so exit counts should record the conditions under which they were made. Similarly, there may be times when females with young do not emerge at all or emerge only briefly and return while other bats are still emerging thus confusing the count. Within roosts, bats will move around according to the temperature and may or may not be visible on any particular visit. Bats also react to disturbance, so a survey the day after a disturbance event, may give a misleading picture of roost usage.'*

The survey involved the methodologies outlined in Collins (2016) which included the roost inspection methodologies i.e. external methodology outlined in section 5.2.4.1 and the internal survey outlines in section 5.2.4.2 of the guidelines. In addition, the methodologies for Presence absence surveys (Section 7) was carried out for dust emergent surveys.'

As outlined in Collins (2016) 'The bat active period is generally considered to be between April and October inclusive (although the season is likely to be shorter in northern latitudes). However, because bats wake up during mild conditions, bat activity can also be recorded during winter months.'

Survey Results

Trees as potential bat roosts.

A ground level roost assessment was carried and used to examine the trees on site for features that could form bat roosts. Potential roosting features include heavy ivy growth, broken limbs, areas of decay, vertical or horizontal cracks, cracks in bark etc. All trees on site were assessed for bat roosting potential.

There are a number of trees of bat roosting potential within this treeline, thereby suggesting that a bat roost may be present within this treeline. However, it should be noted that this treeline is located outside of the subject site's boundary and, as such, no trees of bat roosting potential will be removed as part of the proposed development.

Emergent/detector surveys.

An emergent /detector survey was carried out on 2nd October 2019, 20th July 2023 and 19th May 2024.

The detector survey was undertaken within the active bat season and the transects covered the entire site multiple times during the night. Weather conditions were good with mild temperatures greater than 10°C immediately after sunset. Winds were light and there was no rainfall during the emergent survey. Insects were observed in flight during the survey and bats were observed on site.

As outlined in Collins (2016) in relation to weather conditions *'The aim should be to carry out surveys in conditions that are close to optimal (sunset temperature 10°C or above, no rain or strong wind.), particularly when only one survey is planned.... Where surveys are carried out when the temperature at sunset is below 10°C should be justified by the ecologist and the effect on bat behaviour considered.'* There were no constraints in relation to the survey carried out. All areas of the site were accessible. Weather conditions were optimal for the emergent survey however, rainfall during the acoustic transect survey was sub-optimal for bat assessments.

At dusk, a bat detector survey was carried out onsite using a*n Echo meter touch 2 Pro* detector to determine bat activity. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations. The weather conditions were ideal for bat surveying for the emergent survey.

A single Soprano pipistrelle (*Pipistrellus pygmaeus*) was noted emerging from the eastern tree line (trees on opposite side of eastern boundary wall of subject site) during all surveys. There was minor foraging activity detected on site in 2019 but not in 2023 and 2024. Streetlights illuminated the northern boundary, which would have had a deterring effect on bat activity. In 2024, a single Leisler's Bat (*Nyctalus leisleri*) was noted foraging along the southwestern and southeastern boundary of the subject site and a single common pipistrelle was also noted foraging within the treeline along the eastern boundary and in the southeastern corner of the site.

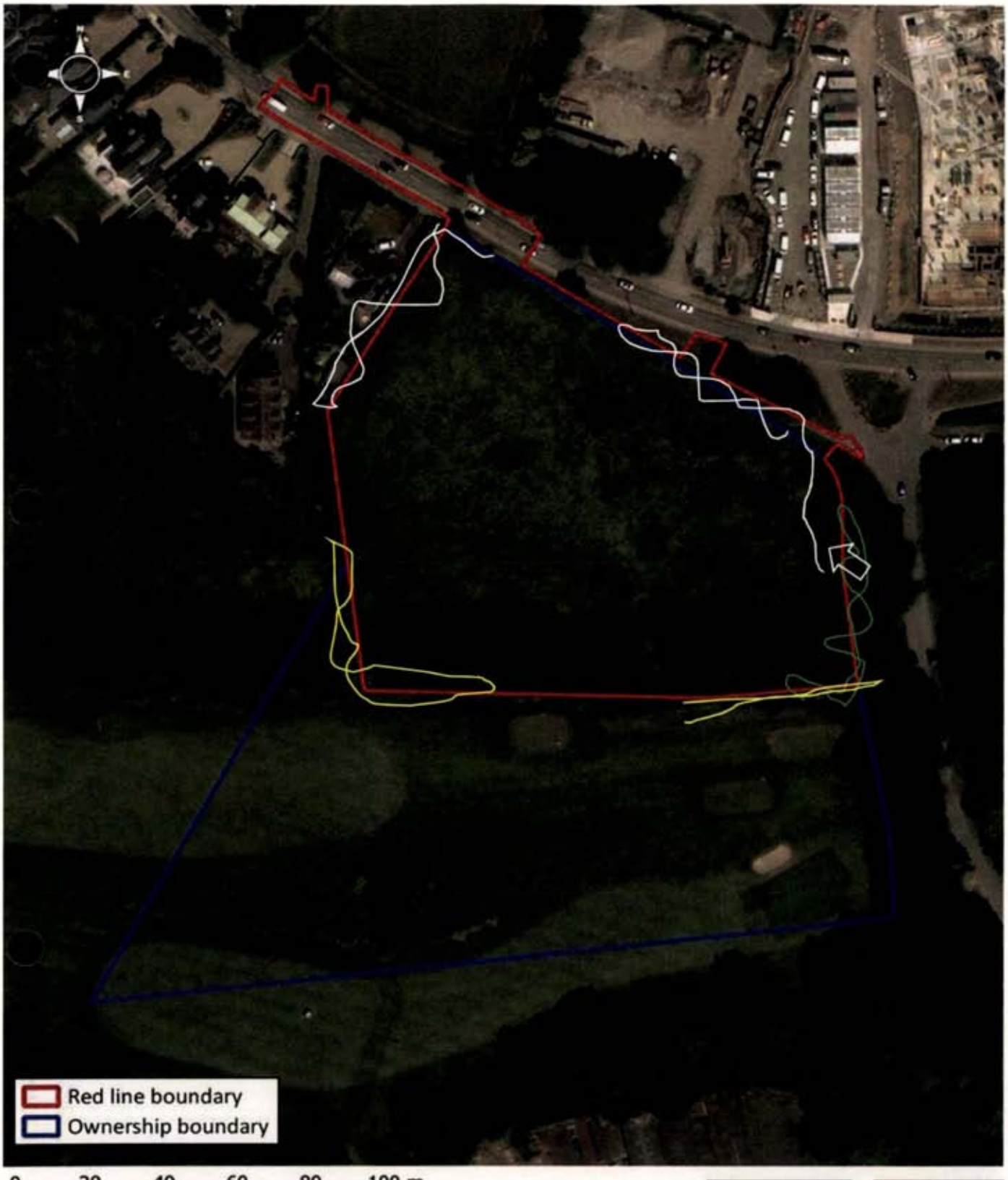


Figure 6: *Leisler's Bat (Nyctalus leisleri) (yellow), Soprano Pipistrelle (Pipistrellus pygmaeus) (white), and Common Pipistrelle (Pipistrellus pipistrellus sensu lato) (green)*

Bat Assessment Findings

Review of local bat records

The review of existing bat records (sourced from Bat Conservation Ireland's National Bat Records Database) within a 2km^2 grid (Reference grid O23U) encompassing the study area reveals that four of the nine known Irish species have been observed locally (Table 1). The National Biodiversity Data Centre's online viewer was consulted in order to determine whether there have been recorded bat sightings in the wider area. This is visually represented in Figures 9 & 10. The following species were noted in the wider area: Soprano Pipistrelle (*Pipistrellus pygmaeus*), Common Pipistrelle (*Pipistrellus pipistrellus sensu lato*), Brown Long-Eared Bat (*Plecotus auratus*) and Lesser Noctule (*Nyctalus leisleri*) (Figures 9 & 10).

Table 1: *Status of bat species within the 2km^2 grid (O23U)*

Species Name	Record Count	Date of Last Record	Designation
Brown Long-eared Bat (*Plecotus auritus*)	5	19/04/2016	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Lesser Noctule (*Nyctalus leisleri*)	1	23/05/2006	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	1	23/05/2006	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	1	23/05/2006	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

Figure 9. *Soprano Pipistrelle* (Pipistrellus pygmaeus) *(yellow), common pipistrelle (*Pipistrellus pipistrellus sensu lato*) (purple) (Source NBDC) (Site location – red circle).*

Figure 10. *Brown Long-eared Bat (*Plecotus auritus*) (purple) and Lesser Noctule (*Nyctalus leisleri*) (orange) (Source NBDC) (Site location – red circle).*

Evaluation of Results

The bat surveys comply with bat survey guidance documentation including Marnell et al (2022) and Collins (2016). A single Soprano pipistrelle (*Pipistrellus pygmaeus*) was observed emerging from trees to the east of the eastern site boundary during all three surveys. A single Leisler's Bat (*Nyctalus leisleri*) was noted foraging along the southwestern and southeastern boundary of the subject site in 2024. The site is of relatively low importance to the local bat population.

Potential Impact of the development on Bats

The removal of trees and the increase in lighting on site will not result in a significant negative impact on bat foraging. The treeline of bat roosting potential is located outside of the subject site's boundary and, as such, no trees of bat roosting potential will be removed as part of the proposed development. The open space of the development will be proximate to this treeline and additional tree planting is proposed in this area. However, there may also be negative impacts on bat flight corridors between roosting and foraging areas due to the removal of trees. Foraging on site was not detected in 2023 but minor foraging was noted in 2019 and 2024. As there was no bat roost onsite, a NPWS derogation licence is not required. Evidence of roosting was detected within the mature trees to the east of the eastern boundary wall of the subject site. In the absence of mitigation light spill from the proposed development could have a negative impact on roosting bats. Therefore, mitigation measures are required to limit light spill and to comply with bat lighting guidelines are required.

Mitigation Measures

As outlined in Marnell et al. (2022) "*Mitigation should be proportionate. The level of mitigation required depends on the size and type of impact, and the importance of the population affected.*" In addition, as outlined in Marnell et. al (2022) '*Mitigation for bats normally comprises the following elements:*

- *Avoidance of deliberate, killing, injury or disturbance – taking all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats. The seasonal occupation of most roosts provides good opportunities for this*
- *Roost creation, restoration or enhancement – to provide appropriate replacements for roosts to be lost or damaged*
- *Long-term habitat management and maintenance – to ensure the population will persist*
- *Post-development population monitoring – to assess the success of the scheme and to inform management or remedial operations.'*

As no evidence of a bat roost was noted in any of the onsite trees, no mitigation measures in regard to these animals are needed during the proposed construction works. There is also no requirement for a *National Parks and Wildlife Service* derogation licence application to allow the planned works. Lighting during construction should only be used during working hours with no floodlighting of the site. The ecologist will be consulted in relation to lighting. The lighting strategy will implement warm coloured lighting less than or equal to 3000 k, and mitigation implemented to prevent light spill into the tree line adjacent to the eastern site boundary wall.

Predicted Residual Impact of Planned Development on Bats

Existing lighting is observed from the road to the north of the site. The removal of trees and the increase in lighting on site will result in a low adverse effect on bat foraging. Minor foraging on site was detected and is deemed to be of low foraging importance to bats in the surrounding area. As there was no bat roost onsite a NPWS derogation licence is not required for the removal of trees. No trees of bat roosting potential are to be removed. Based on the limited amount of bat activity, displacement from this site it will not have any significant effect on local bat populations, and that any such effect will be only minor adverse at the local level. No bat roosts or potential bat roosts will be lost due to this development and the species expected to occur onsite should persist. In the absence of a sensitive lighting strategy and mitigation trees that may form bat roosts adjacent to the eastern site boundary may be negatively affected by light spill. Following mitigation within the lighting strategy to reduce light spill and intensity, the species expected to occur onsite and in the surrounding area should persist

References

Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1

Marnell, F., Kelleher, C. & Mullen, E. (2022). *Bat mitigation guidelines for Ireland V2. Irish Wildlife Manuals, No. 134.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Chartered Institute of Ecology and Environmental Management (2021). *Bat Mitigation Guidelines: A guide to impact assessment, mitigation and compensation for developments affecting bats. Beta version.* Chartered Institute of Ecology and Environmental Management, Winchester.

Chartered Institute of Ecology and Environmental Management (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine.* Chartered Institute of Ecology and Environmental Management, Winchester.

Institution of Lighting Professionals (2018). *Bats and Artificial Lighting in the UK – Bats and the Built Environment Series: Guidance Note 08/18.* Institution of Lighting Professionals and the Bat Conservation Trust.

Department of Housing, Planning and Local Government (December, 2018). *Urban Development and Building Heights Guidelines for Planning Authorities.*

Bat Conservation Trust (May 2022). *Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys.* The Bat Conservation Trust, London.

Bat Conservation Ireland 2004 on-going, *National Bat Record Database.* Virginia, Co. Cavan

Boyd, I. and Stebbings, R.E. 1989 Population changes in brown long-eared bats (*Plecotus auritus*) in Bat Boxes at Thetford Forest. *Journal of Applied Ecology* **26**: 101 - 112

Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1982

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979

EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive) 1992

Jefferies, D.J. 1972 Organochlorine insecticide residues in British bats and their significance. *Journal of Zoology*, London **166**: 245 - 263

Kelleher, C. 2004, Thirty years, six counties, one species – an update on the lesser horseshoe bat *Rhinolophus hipposideros* (Bechstein) in Ireland – *Irish Naturalists' Journal* **27**, No. 10, 387 – 392

Kelleher, C. 2015 *Proposed Residential Development, Church Road, Killiney, Dublin: Bat Fauna Study*. Report prepared for Altemar Marine and Environmental Consultants

Marnell, F., Kingston, N. and Looney, D. 2009 *Ireland Red List No. 3: Terrestrial Mammals.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin

Marnell, F., Kelleher, C., & Mullen, E. (2022), BAT MITIGATION GUIDELINES FOR IRELAND – V2 https://www.npws.ie/sites/default/files/publications/pdf/IWM134.pdf

Racey, P.A. and Swift, S.M. 1986 The residual effects of remedial timber treatments on bats. *Biological Conservation* **35**: 205 – 214

Smal, C.M. 1995 *The Badger & Habitat Survey of Ireland.* The Stationery Office, Dublin

Wildlife Act 1976 and Wildlife [Amendment] Act 2000. Government of Ireland.

APPENDIX 15.1
ARCHAEOLOGICAL TESTING

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

John Purcell

Archaeological Consultancy

jparch.ie **Mob.** 086 2506506

Archaeological Testing at Ballymurphy,

Howth Demesne

Licence Number 24E0310

April 2024

Client: **Marina Quarter Ltd.**

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1 Introduction

This report assesses the impact of a proposed development on the archaeology of a site at Howth Demesne, Howth, Co. Dublin. The report includes a desktop study and archaeological testing. A geophysical survey was undertaken at the site prior to these works by JML surveys (Licence 20R0118), this did not reveal any archaeological remains.

The desktop section of the report was compiled using: The Records of Monuments and Places; buildings of Ireland, Excavations Bulletin; historic maps; aerial photographs; place names and historic books and journals. The recorded and potential cultural heritage resource within the proposed development site and the surrounding its boundary were assessed in order to compile a complete cultural heritage context.

Archaeological testing was undertaken in March 2024. John Purcell Archaeological Consultancy undertook this report. Field walking was undertaken by John Purcell.

Figure 1: Location of development

2 Receiving Environment and Proposed Development

2.1 Receiving Environment

The study area is bounded by the R105 at the north and by an access road to Howth Demesne at the east. Howth Castle is to the southeast and Deer Park Golf Club forms the southern boundary. Howth Village is located to the east. The site is within the townland of Howth Demesne. The site is laid out in rough pasture.

2.2 Proposed Development

Planning permission is sought for a large-scale residential development on an overall site of approx. 1.5 hectares. The development comprises the delivery of 135 dwellings including 63 no. 1-bedroom units and 72 no. 2-bedroom units across two offset blocks ranging in height from 3-5 storeys. 63 car parking spaces including 4 accessible spaces & 13 EV charging spaces and 6 motorcycle spaces proposed at surface level. A total of 410 bicycle spaces are proposed including the provision of secure bicycle stores. Partial demolition of 3 sections of the existing northern boundary wall, which fronts Howth Road, proposed to facilitate vehicular and pedestrian access. Undergrounding and relocation of existing ESB overhead lines and diversion of existing distribution gas pipes around the site are also proposed.

3 Methodology

This report has been prepared having regard to the following guidelines;

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018)
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017)
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017)
- National Monuments Acts, 1930-2014
- Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023.
- The Planning and Development (Strategic Infrastructure) Bill, 2006
- Heritage Act 1995
- Frameworks and Principles for the protection of Archaeological Heritage 1999

- Architectural Heritage (National Inventory) and Historic Monuments and the Local Government (Planning and Development) Act 2000

3.1 Study Methodology

This assessment consists of a paper survey identifying all recorded sites within the vicinity of the proposed development and a site inspection. The methodology has been conducted based on the guidelines from the Department of Culture, Heritage and the Gaeltacht (DAHG).

The desktop survey undertaken consisted of a document and cartographic search utilising a number of sources including the following:

- Record of Monuments and Places (RMP); The RMP records known upstanding archaeological monuments, the original location of destroyed monuments and the location of possible sites identified through, documentary, cartographic, photographic research and field inspections.
- The RMP consists of a list, organised by county and subdivided by 6" map sheets showing the location of each site. The RMP data is compiled from the files of the Archaeological Survey.
- National Inventory of Architectural Heritage; The inventory of architectural heritage lists all post 1700 structures and buildings in the country. This includes structures of architectural, historical, archaeological, artistic, cultural, social, scientific or technical importance.
- County Development Plans; The Development plan was consulted to ascertain if any structures listed in the Record of Protected Structures (RPS) and/or any Architectural Conservation Areas (ACAs). The Record of Protected Structures lists all protected structures and buildings in Wicklow. This includes structures of architectural, historical, archaeological, artistic, cultural, social, scientific or technical importance.
- Cartographic Sources; The following maps were examined: Down Survey, 1st edition Ordnance Survey Maps (1836-1846) and 2nd edition Ordnance Survey Maps (1908), Rocque Map and the Cassini Map.
- Literary Sources; Various published sources, including local and national journals, were consulted to establish a historical background for the pro-

posed development site. Literary sources are a valuable means of completing the written record of an area and gaining insight into the history of the environs of the proposed development. Principal archaeological sources include: The Excavations Bulletin; Local Journals; Published archaeological and architectural inventories; Peter Harbison, (1975). Guide to the National Monuments of Ireland; and O'Donovan's Ordnance Survey Letters.

- Previous archaeological assessments and excavations for the area were reviewed.

A comprehensive list of all literary sources consulted is given in the bibliography.

3.2 Site Inspections

An archaeological field inspection survey seeks to verify the location and extent of known archaeological features and to record the location and extent of any newly identified features. A field inspection should also identify any areas of archaeological potential with no above ground visibility. A geophysical survey was undertaken to identify sub surface remains within the development. Further to this archaeological testing was undertaken to verify these results.

3.3 Difficulties Encountered

No difficulties that could hinder the archaeological assessment were encountered,

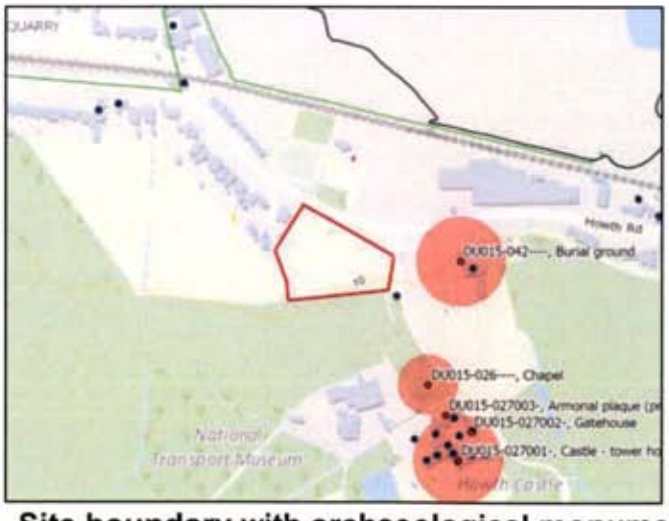

Figure 2: Site boundary with archaeological monuments marked

4 General Archaeological and Historical Summary

4.1 Brief Archaeological Background

Mesolithic to Bronze Age

Hunter-gatherer communities or Mesolithic people reached Ireland around 8000 BC. Early Mesolithic sites in Ireland are frequently found in coastal areas or further inland along river valleys. These settlers have left little trace on the landscape. Most Mesolithic sites are found accidentally, often by recovering Mesolithic stone tools from ploughed fields. The recovery of artefacts and identification of sites is usually where farmland is ploughed or in areas where developments include a topsoil strip. Most of the known Mesolithic material has been found on archaeological excavations. The Mesolithic period is divided into two periods – early (c. 8000–6500 BC) and late (6500–4000 BC) based on the type of tools.

The arrival of agricultural in the Neolithic Period led to a more sedentary way of life. The most visible remains associated with this period are megalithic tombs. These are recorded across the country. Over 90 Neolithic houses have been recorded across in Ireland. These are usually not visible at ground level and are only recorded during archaeological testing and excavation.

The commonest prehistoric monument are barrows. These are associated with the Bronze/Iron Age burial tradition (c. 2400 BC - AD 400) and are defined by an artificial mound of earth or earth and stone, normally constructed to contain or conceal burials. These sites vary in shape and scale and can be variously described as bowl-barrow, ditch barrow, embanked barrow, mound barrow, pond barrow, ring-barrow and stepped barrow. The incidence and frequency of these sites in the area attests to the extent of prehistoric settlement in this area from earliest times.

Iron Age to Early Medieval Period

In late Bronze Age Ireland the use of the metal reached a high point with the production of high quality decorated weapons, ornament and instruments, often discovered from hoards or ritual deposits. The Iron Age however is known as a 'dark age' in Irish prehistory. Iron objects are found rarely, but there is no evidence for the warrior culture of the rest of Europe, although the distinctive La Tené style of art with

animal motifs and spirals was adopted. Political life in the Iron Age seems to have been defined by continually warring petty kingdoms vying for power. These kingdoms, run on an extended clan system, had their economy rooted in mixed farming and, in particular, cattle. Settlement was typically centred on a focal hillfort. Settlement in the Early Medieval Period is defined by the ringfort. These are the commonest monument across the country and have been frequently recorded in the environs of the town.

The introduction of Christianity to Ireland in the fifth century had a profound impact on Gaelic society, not in the least in terms of land ownership and the development of churches and religious houses. A number of early Christian Monuments are located in the vicinity of the site these include Holy Wells and Bullaun stones.

Historic Period

Following the Norman Conquest of the county a number of Motte and Baileys were constructed in the area, including the site at the rear of the site. These consist of square, rectangular or occasionally circular area, sometimes raised above the ground, enclosed by a wide, often water-filled, fosse, sometimes with an outer bank and with a wide causewayed entrance. They date to the late 13th/early 14th centuries and were primarily fortified residences/farmsteads of Anglo-Norman settlers though they were also built by Gaelic lords. These represent the first Anglo Norman foray in the area. After the moated sites a series of Tower Houses were built across the county by the Normans descendants and local families.

Post Medieval Ireland

Seventeenth century Ireland saw massive upheaval a result of the Confederate wars, the Cromwellian response and the Wars of the two kings. The impact on the country was profound. It has been estimated that up to a third of the population was wiped out because of famine, disease and war. Soldiers were given land as payment resulting in further upheaval of the local population and the establishment of large estates. These came to dominate the landscape from this period onwards. Religious intolerance in other parts of Europe resulted in the expulsion of the Huguenot from France which were welcomed by the English Crown into Ireland.

4.2 Archaeological Monuments

The site does not include any registered monuments however this area has been a number of monuments centred on Howth Castle. These are listed below (details taken from archaeology.ie).

RMP	Classification	Townland	Distance
DU 015 026	Church	Howth Demesne	80m
DU 015 027/03	Armorial Plaque	Howth Demesne	130m
DU 015 027/02	Gatehouse	Howth Demesne	180m
DU 015 027/01	Castle	Howth Demesne	210m
DU 015 042	Graveyard	Howth Demesne	130m
DU015-032	Portal Tomb	Howth Demesne	1km

DU015-026----

Class: Chapel

Townland: HOWTH DEMESNE

Located on the grounds of Howth Castle north of the stableyard and west of the driveway, the church is surrounded by overgrowth and ivy covered. This large medieval chapel is rectangular in plan (int. dims. L 12.20m, Wth.4.50m) and built of randomly coursed sandstone masonry with dressed quoins. Originally entered through opposed doorways (blocked) which have almost flat segmental arches at west end of nave. The remains of a pointed arched opening in west end forms the entrance. The arch has been modified at the base, stone removed and brick inserted. Tufa has been used for one of the southern jambs. An impressive E window has a pointed arch with dressed sandstone hood and roll moulding internally. Draw bar holes are present. There are blocked up, flat, segmental arched windows at E end of N and S walls. Appears to be some dumping of material internally.

DU015-027001-

Class: Castle - tower house

Townland: HOWTH DEMESNE

Located in grounds on the N side of Howth Head overlooking Irelands Eye. A fine gatehouse *DU015-027002-) is attached by a battlemented wall to Howth Castle which incorporates in its southern range a massive three-storey tower house with corner towers. Attached to the E of this is a two storey hall of 17th century date.

Classical style alterations to the central hall date from the early 18th-century when the castle was enlarged and modernised by William St. Lawrence (Bence-Jones 1988, 155-156; Dawson 1976, 122-132; Mc Cready 1893, 447). Re-rendered c.1990.

The ground floor of the tower house (L 677m, Wth 5.60m, T 1.55m) is entered off the central hall through an opening in a later partition wall that creates a corridor within the original ground floor chamber. There is a dual vault over the ground floor with an interveening wall (Wth 0.66m) that has an opening midway along (Wth 1.02m). Partial remains of a projecting angle tower with a corbelled roof survive in the NE. A spiral stairway (diam. 1.08m) in a square projecting tower off the NW angle provides access to the upper floors. The stairs have been replaced and cut across the window opes. The first floor has been re-modelled with later window opes in the S and W. The SW angle has a tower which may have originally contained a garderobe. The second floor (L8.12m, Wth 6.40m) is entered through a pointed arch doorway (Wth 0.90m). There are window opes in the E and S walls of the main chamber which contain s a corbelled recess in the SW angle tower. This is lit by a single slit loop (L 1.81, Wth 1.52m). There is a squinch in the SE corner which would have been needed to carry a corner tower at battlement level. The spiral stairs provides access to the battlement level with a wall walk connecting four projecting angle towers. A double pitched slate roof is set behind a crow-stepped crenellated parapet.

Architectural fragments have been incorporated into the surrounding buildings including a carved dragon built into the wall at the entrance to the garden and an inscribed Sixteenth-century Tablet at the entrance to stable yard N of castle (Ball 1917, 7, 8, 70, 71 Mc Cready 1893, 447).

DU015-027002
Class: Gatehouse
Townland: HOWTH DEMESNE
The gate house is located on the north side of a courtyard attached to Howth Castle (DU015-027001-) by a rubble stone bawn wall, c.1525, with round headed integral carriageway, gun loops and crow stepped crenellated parapet (NIAH). It stands three storeys high with a battlemented parapet and a NE tower which projects above parapet level. Built of randomly coursed rubble with dressed quoins. A studded

wooden gate is still present on the E side of the gateway below a round arch formed from sandstone and limestone which alternate to create a banding effect. The gateway has a segmental arched vault running E-W. There are buttresses to first floor level on the E and S sides. Two high vaulted chambers are entered off the N side of entrance passage through round-arched passages. Their interior is lit by single slit opes (L 6.40m, Wth 4.20m). The S side is defended by a musket hole. Entrance to upper floors is through the attached outbuildings in the W.

The NE tower contains a stone spiral staircase which is entered through a square-headed doorway of chamfered limestone. There is a fireplace with plain segmental arch on N side on the first floor. The east window is a double-light with a mullion and transom and cusped ogee-heads and a crack in the base of the window arch. A mural chamber off the first floor is lit by plain rectangular windows. Second floor is entered through a pointed arched doorway of chamfered limestone. The fireplace in the NW corner is a later insertion. There is an ogee-headed window on W side. Along the W side of the parapet there is a pointed arched window incorporated into battlements. Renovated 1738.

DU015-027003-
Class: Armorial plaque (present location)
Townland: HOWTH DEMESNE
An armorial plaque (DU019-001002-) was originally set into an external wall of Watermill cottage (DU019-001001-). The armorial plaque is now concreted into the northern façade of the stable block above an entranceway at Howth Castle. It shows the arms of the St. Lawrence family, Howth, 20th Baron of Howth and wife Elizabeth (Plunkett), the initials C.S. and E.P. and a date 1572 (Bowen 1963, 75-76).

DU015-042----
Class: Burial ground
Townland: HOWTH DEMESNE
According to Fr. Shearman human remains were uncovered during the construction of the modern Protestant Church. St Mary's church (1866) was built on the site of an earlier church and is located west Evora Bridge, the site of a great battle. Finds included sword fragments and a jet ring (Shearman 1922, 65). Monitoring (Licence

no. 03E0935) of the insertion of a new gas supply to the north of St Mary's church was undertaken. A 55m long slot trench on the higher ground within the church grounds, revealed at least three situ human burials and evidence for disarticulated remains (D 0.50m). No excavation of the human remains took place (Scally, G. 2003).

DU015-032----

Megalithic tomb - portal tomb

HOWTH DEMESNE

The tomb is ituated by a pathway under tree cover at the edge of Deer Park golf course at the foot of Muck Rock on the north side of Howth Head. There is an entrance in SE to a single chamber (L 2.6m; Wth 1.1m). This is indicated by two portals (H 2.75m and 2.45m respectively). The doorstone has partially collapsed into the chamber. The large roofstone (L 5.2m; Wth 4.2m; D 1.9m) still rests on the upper edge of the portals above the collapsed chamber (Borlase 1897, 2, 376-9; Ó Nualláin 1983, 82, 96).

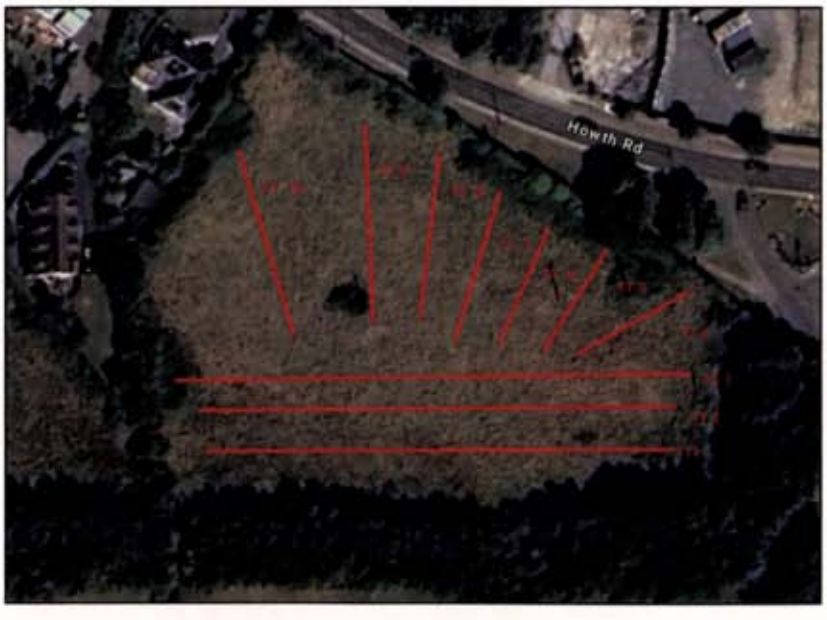

Figure 3: Test trenches Layout

4.4 Cartographic Evidence

The Down Survey of Ireland was undertaken in the years 1656-1658 (Figure 3). The survey sought to measure all the land to be forfeited by the Catholic Irish in order to facilitate its redistribution in what became known as the Cromwellian Plantation. The map shows the Howth castle and the town of Howth to the east.

Figure 4: Downe Survey extract for the proposed development (downsurvey.tchpc.tcd.ie)

Rocque's 1757 map (Figure 4) provides more detail of the castle and its formal gardens. The area of the proposed development site is depicted as open farmland. A lime kiln is marked on the map but its exact location is not noted. It is likely to be associated with the quarry located to the north of the study area.

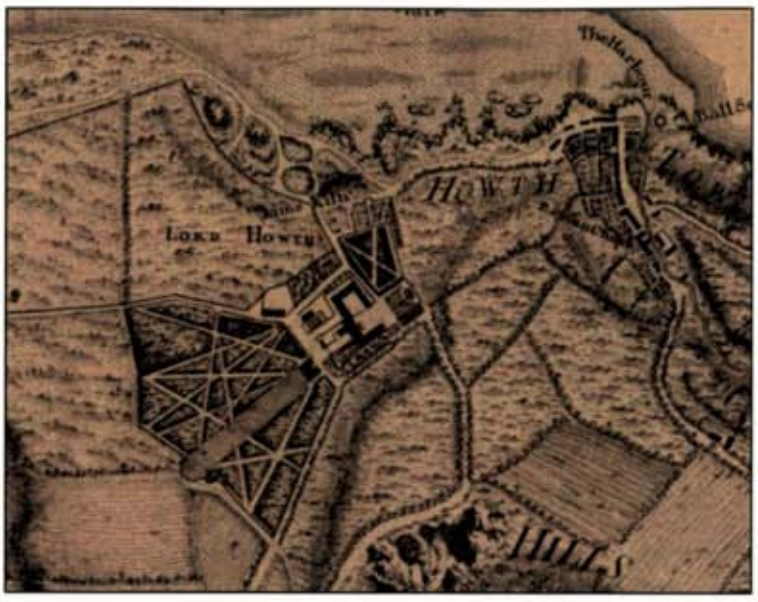

Figure 5: Rocque map of Howth Castle (libguides.ucd.ie)

The first edition of the Ordnance Survey undertaken in 1838 (Figure 5) depicts Howth village as being similar to its present layout. The area to the north of Howth Castle is marked as Deer Park. The proposed development site is occupied by Howth Park Racecourse.

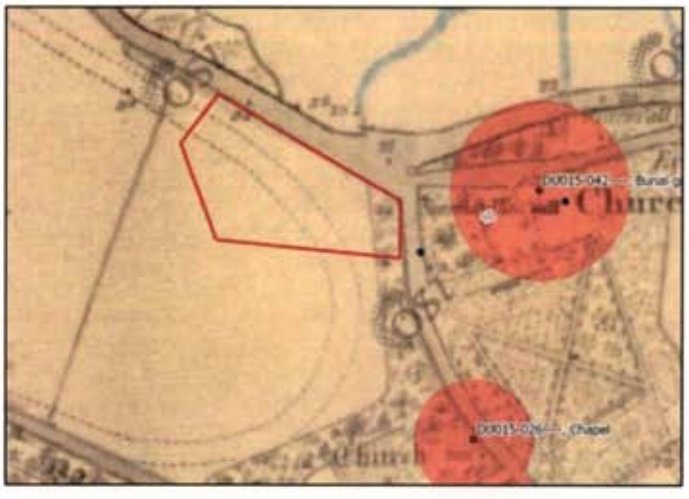

Figure 6: First Edition OS map for the site

Figure 7: 25 inch map for the site

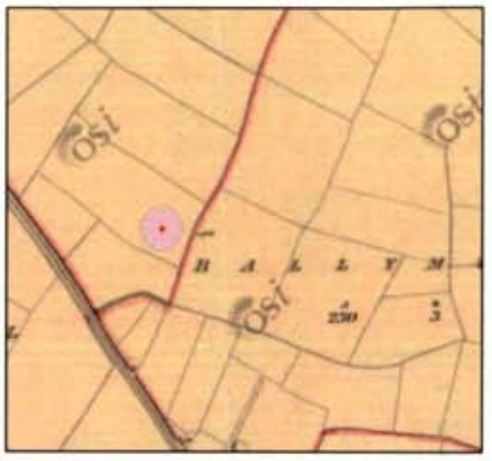

Figure 8: First Edition OS map for the site

Figure 9: 25 inch map for the site

Figure 10: Aerial photograph for the site (taken fromgeohive.ie)

4.5 Geophysical Survey

A geophysical survey was undertaken at the site by JML Surveys in 2020 (Licence 20R0118), this did not uncover any archaeological remains. No overall patterns were visible indicative of archaeological remains (Figure 4).

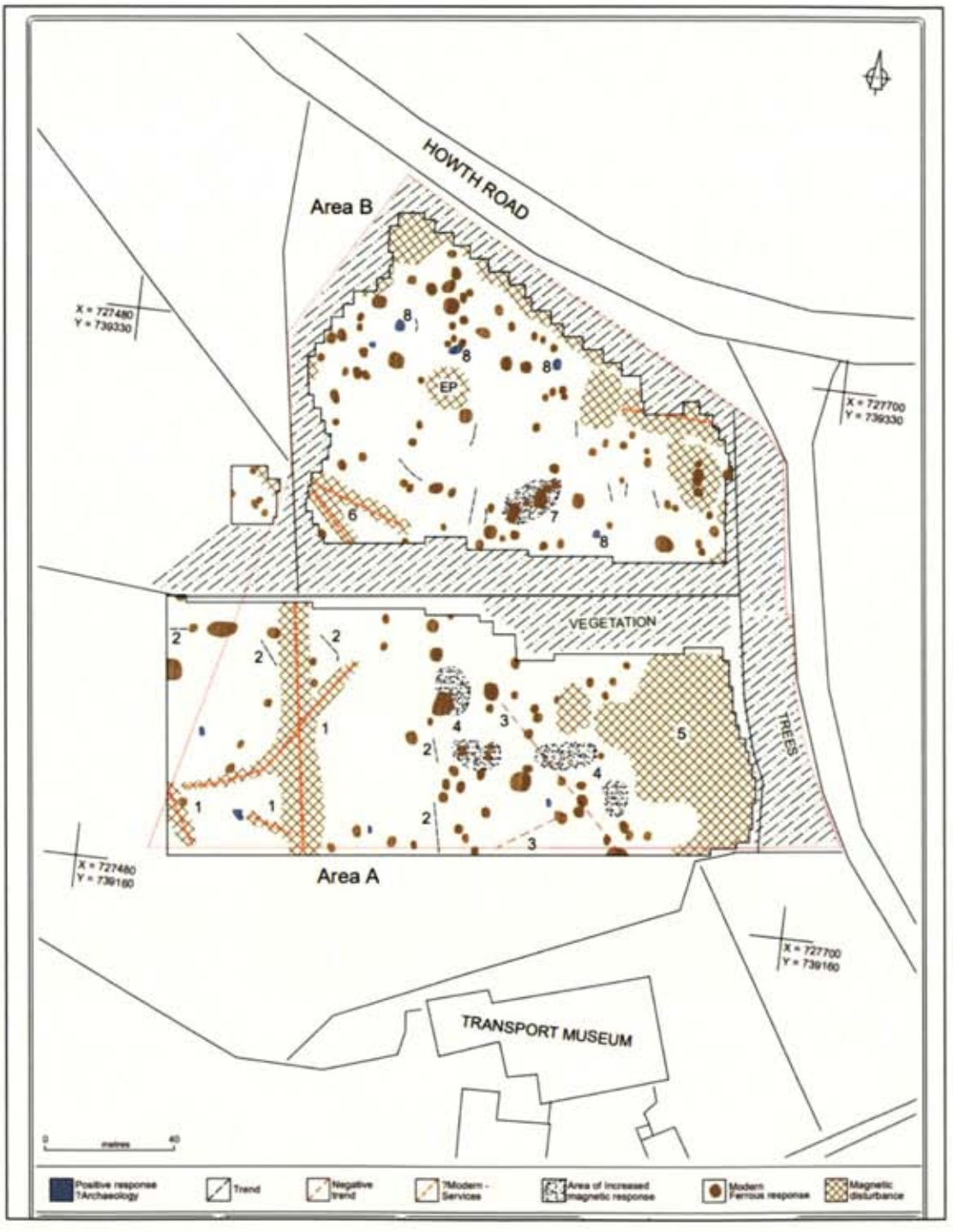

Figure 11: Greyscale magnetometry data

4.6 Topographical Files

An examination of the topographical files housed in the National Museum of Ireland revealed a number of results for the townland of Howth Demesne. These are listed in the table below;

NMI Register	Find type	Location	Townland
1954:64	Slag	Dolmen Howth demesne	Howth Demesne
2000;71	Ring	Claremont Strand	Howth Demesne
2021:11	Human remains	St. Marys Church	Howth Demesne
2021:95	Sword	Howth Castle	Howth Demesne
2022:3	Bell	St. Marys Abbey	Howth Demesne
2022:4	Bell	St. Marys Abbey	Howth Demesne
2022.:5	Bell	St. Marys Abbey	Howth Demesne

5 Archaeological Testing

5.1 Archaeological Test Trenches

Archaeological testing was undertaken in September 2023 (Plates 1-6). The results are outlined below.

Test Trenches 1-3

These trenches were excavated using a mechanical excavator using a grading bucket at the north of the site. The test trenches were excavated for 100m east to west and were 1.5m in width. The test trenches were excavated through the sod and topsoil which measured 0.3-0.4m in depth. An orange/brown boulder clay was exposed across the site. A number of drainage channels were identified across the field. No archaeological finds, features or artefacts were identified.

Trenches 4-6

These trenches were excavated using a mechanical excavator using a grading bucket at the west of the site. The trenches were 55-60m in length and 1.5m in width. The test trenches were excavated through the sod and topsoil which measured 0.3-0.4m in depth. An orange brown subsoil was exposed below this. A number of modern areas of disturbance were identified at the north of the trenches. No archaeological finds, features or artefacts were identified.

Trenches 7-10

These trenches were excavated using a mechanical excavator using a grading bucket at the west of the site. The trenches were 55-60m in length and 1.5m in width. The test trenches were excavated through the sod and topsoil which measured 0.3-0.4m in depth. An orange brown subsoil was exposed below this. No archaeological finds, features or artefacts were identified.

6 Impact on the Cultural Heritage Landscape

6.1 Recorded Monuments

The site is located in the townland of Howth Demesne. The site does not include any archaeological monuments listed in the RMP for the study area. No archaeological sites were identified during a geophysical survey at the site. Archaeological testing did not reveal any deposits or features.

6.3 Archaeological Potential

Archaeological testing was undertaken across the site. This did not identify any archaeological remains at the site. The trenches were excavated to maximise the area tested. No archaeological finds, features or artefacts were identified. The potential for archaeological remains to exist at the site is low.

7 Conclusions

The proposed development consists of the construction of a housing development at Howth Demesne, Howth, Co. Dublin. A geophysical survey and archaeological testing was undertaken at the site, no archaeological remains were identified during these works. The site is not located in the vicinity of any archaeological monument and will not impact on the wider archaeological landscape. The potential for archaeological remains to exist at the site is low, as a result of this no further archaeological input is required.

All recommendations are subject to agreement with the Department of Housing, Heritage and Local Government.

References

Department of Arts, Heritage, Gaeltacht & the Islands, 1999, Policy and Guidelines on archaeological excavation.

Edwards, N. The Archaeology of Early Medieval Ireland, Routledge.

Harbison, 1975, Guide to the National Monuments of Ireland, Gill and MacMillan.

Flanaghan, L. A Dictionary of Irish Archaeology, Rowman and Littlefield.

Mallory J.P. and MacNeill, T.E. 1991, The Archaeology of Ulster, Institute of Irish Studies, Queens University Publica

Plate 1: Test trench 1, looking east

Plate 2: Test trench 2, looking west

Plate 3: Modern drains test trench 3

Plate 4: Test trench 3, looking east

Plate 5: Test trench 4, during excavation

Plate 6: Test trench 5, looking northeast

Plate 7: Test trench 6, looking north

Plate 8: Test trench 7, looking north

Plate 9: Drainage channel in test trench 8

Plate 10: Test trench 8

Plate 11: Test trench 9, looking north

Plate 12: Test trench 10, looking north

APPENDIX 15.2
ARCHAEOLOGICAL GEOPHYSICAL SURVEY

VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

GEOPHYSICAL SURVEY

REPORT

Howth Demesne,

Howth,

County Dublin

Date:
22/02/2021

Licence: 20R0118

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GEOPHYSICAL SURVEY SUMMARY SHEET
HOWTH DEMESNE, HOWTH, COUNTY DUBLIN

Site Name	Howth	**Ref No.**	20029
Townland	Howth Demesne	**Licence No.**	20-R-0118
County	Dublin	**Licence Holder**	Joanna Leigh
ITM (centre)	E727595, N739265	**Purpose**	Pre-planning
Client	John Purcell Archaeology	**Reference No.**	N/A

Ground Conditions Survey was conducted within two areas separated by a substantial field boundary. Area A comprised a well-manicured golf course; Area B comprised an irregularly shaped field which had been cut and cleared prior to survey.

Survey Type Detailed gradiometer survey totalling c. 2.2hectares.

Summary of Results

The geophysical survey data is dominated by modern magnetic disturbance, largely the result of the landscaping and design of the golf course and the presence of multiple modern services.

Some possible isolated pit-type responses have been identified; however, an archaeological interpretation is highly tentative.

Possible former agricultural activity is suggested by multiple linear trends.

Field Staff Joanna Leigh & Susan Curran

Report Date 18/02/2021 **Report Author** Susan Curran

Contents

Geophysical Survey Report
Howth Demesne, Howth, County Dublin

1 Introduction

1.1 A geophysical survey has been conducted by J. M. Leigh Surveys Ltd. at a site in the townland of Howth Demesne, Howth, County Dublin. The survey was requested by John Purcell Archaeology on behalf of Glenveagh Homes Ltd. The survey forms part of a pre-planning investigation.

1.2 The application area is contained within the north-eastern corner of Deer Park Golf Course (Area A) and a small field (Area B) to its north. Howth Castle and the National Transport Museum are located to the south and the site is bounded to the north by the Howth Road. Domestic dwellings lie immediately west of Area B. Figure 1 presents the site and survey location at a scale of 1:2,000.

1.3 There are no recorded monuments within the application area; however, several monuments are located within 200m of the site. A 'Burial ground' (DU015-042) is located c. 80m to the east and a 'Chapel' (DU015-026) is located c. 65m to the south. The upstanding remains and grounds of Howth Castle are situated c. 140m to the south and comprise a 'Castle - tower house; (DU015-027001), a 'Gatehouse' (DU015-027002), and an 'Armorial plaque - present location' (DU015-027003).

1.4 The main aim of the survey was to identify any responses which may represent previously unknown archaeological remains within the application area. It is the objective of the survey to identify the location, nature and extent of any responses of potential archaeological interest.

1.5 The detailed gradiometer survey was conducted under licence 20R0118 issued by the Department of Culture, Heritage and the Gaeltacht (now the Department of Housing, Local Government and Heritage).

2 Survey ground conditions and further information

2.1 The survey area was contained within two distinct areas (A and B) north of Howth Castle. A substantial field boundary separates Areas A and B.

2.2 Area A comprises part of a golf course with well-manicured grounds. A green was situated in the eastern half of the area. A group of mature trees located in the south-western extent impeded survey in places and mature trees along the eastern walled

boundary prevented survey here. This has not affected the overall interpretation of the results.

2.3 Area B comprises a small irregular-shaped field of grass which had been cut and cleared prior to survey. Survey was limited by a wall along the eastern extent and by high vegetation and trees around the perimeter.

3 Survey Methodology

3.1 A detailed gradiometer survey detects subtle variations in the local magnetic field and measurements are recorded in nano-Tesla (nT). Some archaeological features such as ditches, large pits and fired features have an enhanced magnetic signal and can be detected through recorded survey.

3.2 Data was collected with a Bartington Grad 601-2 instrument. This is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey fast and effective.

3.3 The instrument is calibrated in the field to ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.01nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

3.4 All data was collected in 'zigzag' traverses. Grid orientation remained constant throughout to facilitate the data display and interpretation.

3.5 Data was collected with a sample interval of 0.25m and a traverse interval of 1m, providing 6400 readings per 40m x 40m grid. The survey grid was set-out using a GPS VRS unit. Survey tie-in information is available upon request.

3.6 The survey methodology, data presentation and report content adhere to the European Archaeological Council (EAC) (2016) 'Guidelines for the use of Geophysics in Archaeology'.

4 Data display

4.1 A summary greyscale image and accompanying interpretation diagram are presented in Figures 2 and 3, at a scale of 1:1,000.

4.2 Numbers in parenthesis in the text refer to specific responses highlighted in the interpretation diagram (Figure 3).

4.3 Isolated ferrous responses highlighted in the interpretation diagram most likely represent modern ferrous litter and debris and are not of archaeological interest. These are not discussed in the text unless considered relevant.

4.4 The raw gradiometer data is presented in archive format in Appendix A1.01. The raw data is displayed as a greyscale image and xy-trace plot, both at a scale of 1:500. The archive plots are used to aid interpretation of the results and are used for reference only. The archive plots are available as PDF images upon request.

4.5 The display formats referred to above and the interpretation categories are discussed in the summary technical information section at the end of this report.

5 Survey Results

Area A

5.1 Area A is dominated by modern disturbance which results from landscaping and features relating to the golf course, particularly in the eastern half where the green is located. The magnetic disturbance may mask more subtle responses and it is possible that responses resulting from more subtle archaeological features remain undetected.

5.2 A linear sequence of ferrous responses (1) in the western half of the data set are likely to represent buried modern services.

5.3 Several linear trends (2) have been identified in the western half of the data set. These do not form a coherent pattern and they may be the result of former agricultural activity. However, given the level of landscaping in this area, they may equally be more modern in origin.

5.4 Two perpendicular negative linear trends (3) are evident in the eastern half of the data set. These are suggestive of drainage features, most likely associated with the golf course. They are not considered to be of archaeological interest.

5.5 Several areas of increased response (4) are found in the central part of the application area. These most likely relate to more deeply buried ferrous material and are not considered to be of archaeological interest.

5.6 An amorphous spread of magnetic disturbance (5) dominates the eastern half of the data set. This corresponds with the location of a golfing green. The OS 6inch mapping depicts a curving pathway running through this area; it is possible that this has also contributed to some of the disturbance here. While this is not considered to be of archaeological interest, it may obscure more subtle archaeological responses.

Area B

5.7 Area B is dominated by modern ferrous responses and magnetic disturbance resulting. It is possible that responses resulting from more subtle archaeological features have been obscured by the high level of disturbance.

5.8 A number of linear ferrous responses (6) have been identified which are likely to represent buried modern services. The magnetic signature of these responses is consistent with those (2) identified in Area A.

5.9 An area of increased magnetic response (7) with several ferrous responses is evident in the southern half of the data set. This most likely represents more deeply buried ferrous material and is not considered to be of archaeological potential.

5.10 A number of isolated positive responses (8) have been identified within the data set. It is possible that these represent pit-type features; however, an archaeological interpretation is tentative. Given the level of modern disturbance within Area B, it is more likely that they represent more deeply buried ferrous material.

5.11 Several linear trends are evident throughout Area B. They do not form a coherent pattern and are most likely agricultural in origin.

6 Conclusion

6.1 The survey data set is dominated by modern disturbance which may obscure more subtle archaeological responses. These include modern service pipes which have been identified in both Areas A and B.

6.2 A number of possible pit-type responses have been identified in Area B, although interpretation is tentative given the level of modern disturbance at the site.

6.3 Features associated with the landscaping and design of the golf course have been identified in Area A, including the green and probable drainage features.

6.4 Several linear trends are suggestive of former agricultural activity (or modern landscaping in Area A). They are not considered to be of archaeological potential.

6.5 Consultation with a licensed archaeologist and with Department of Housing, Local Government and Heritage is recommended to establish if any additional archaeological works are required.

7 Technical Information Section

Instrumentation & Methodology

Detailed Gradiometer Survey

Detailed gradiometer survey can either be targeted across a specific area of interest or conducted as a blanket survey across an entire application area, often as a standalone methodology.

Sampling methodologies can vary but a typical survey is conducted with a sample interval of 0.25m and a traverse interval of 1m. This allows detection of potential archaeological responses. Data is often collected in grids measuring 40m x 40m, with the data displayed accordingly. A more detailed survey methodology may be applied where archaeological remains are thought likely. This can sometimes produce results with a more detailed resolution. A survey with a grid size of 20m x 20m and a traverse interval of 0.5m will provide a data set with high resolution.

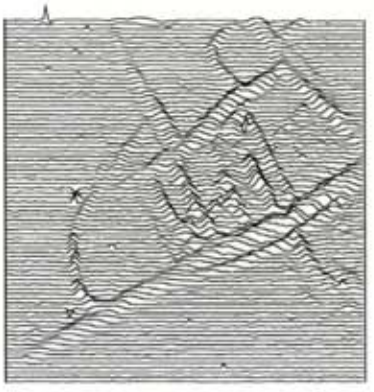
Bartington GRAD 601-2

The Bartington Grad 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.

Frequent realignment of the instruments and zero drift correction ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

Gradiometer Data Display & Presentation

XY Trace



The data are presented as a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This display option is essential for distinguishing between modern ferrous materials (buried metal debris) and potential archaeological responses. The XY trace plot provides a linear display of the magnitude of the response within a given data set.

*Greyscale**

As with dot density plots, the greyscale format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within the given data set. This display method also enables the identification of discrete responses that may be at the limits of instrument detection. In the summary diagrams processed, interpolated data is presented. Raw un-interpolated data is presented in the archive drawings along with the xy-trace plots.

Interpretation

An interpretation of the data is made using many of the plots presented in the final report, in addition to examination of the raw and processed data. The project managers' knowledge and experience allows a detailed interpretation of the survey results with respect to archaeological potential.

**XY Trace and raw greyscale plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation. The archive plots are provided as PDF images upon request.*

Glossary of Interpretation Terms

Categories of responses may vary for different data sets. The list below are the most commonly used categories for describing geophysical responses, as presented in the summary interpretation diagrams.

Archaeology

This category refers to responses which are interpreted as of clear archaeological potential and are supported by further archaeological evidence such as aerial photography or excavation. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, pits and associated features.

?Archaeology

This term corresponds to anomalies that display typical archaeological patterns where no record of comparative archaeological evidence is available. In some cases, it may prove difficult to distinguish between these and evidence of more recent activity also visible in the data.

Area of Increased Magnetic Response

These responses often lack any distinctive archaeological form, and it is therefore difficult to assign any specific interpretation. The resulting responses are site specific, possibly associated with concentrations of archaeological debris or more recent disturbance to underlying archaeological features.

Trend

This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

Ploughing/Ridge & Furrow

Visible as a series of linear responses, these anomalies equate with recent or archaeological cultivation activity.

?Natural

A broad response resulting from localised natural variations in the magnetic background of the subsoil; presenting as broad amorphous responses most likely resulting from geological features.

Ferrous Response

These anomalies exhibit a typically strong magnetic response, often referred to as 'iron spikes,' and are the result of modern metal debris located within the topsoil.

Area of Magnetic Disturbance

This term refers to large-scale magnetic interference from existing services or structures. The extent of this interference may in some cases obscure anomalies of potential archaeological interest.

Bibliography

European Archaeological Council (EAC) (2016) '*Guidelines for the use of Geophysics in Archaeology*' by Armin Schmidt, Paul Linford, Neil Linford, Andrew David, Chris Gaffney, Apostolos Sarris and Jörg Fassbinder.

English Heritage (2008) '*Geophysical guidelines: Geophysical Survey in Archaeological Field Evaluation*.' Second Edition.

Gaffney, C. Gater, J. & Ovenden, S. (2006) '*The use of Geophysical Techniques in Archaeological Evaluations*.' IFA Paper No. 6.

Gaffney, C & Gater, J (2003). '*Revealing the buried past: Geophysics for Archaeologists*.' Tempus Publishing Limited.

National Soil Survey of Ireland (1980) *General soil map second edition (1:575,000)*. An Foras Taluntais.

List of Figures

Figure	Description	Paper Size	Scale
Figure 1	Site & survey location diagram	A4	1:2,000
Figure 2	Summary greyscale image	A3	1:1,000
Figure 3	Summary interpretation diagram	A3	1:1,000

Archive Data Supplied as a PDF Upon Request

A1.01	Raw data greyscale image & XY-Trace plot	A1	1:500

Application Area

Gradiometer Survey

Not suitable for survey - Trees and vegetation

0 metres 80

Client: John Purcell Archaeology	Project: Geophysical Survey Howth Demesne, Howth, County Dublin	Title: Site & Survey Location	J.M. Leigh Surveys Ltd. www.jmlsurveys.com

Scale @ A4: 1:2,000
Figure: 1
Licence No.: 20R0118
Issue Date: 22.02.2021

Area B

X = 727480
Y = 739330

X = 727700
Y = 739330

VEGETATION

TREES

X = 727480
Y = 739160

Area A

X = 727700
Y = 739160

TRANSPORT MUSEUM

2.5
nT
-1.5

N

0 metres 40

Client: John Purcell Archaeology	Project: Geophysical Survey Howth Demesne, Howth, County Dublin	Title: Summary Greyscale Image	J.M. Leigh Surveys Ltd. www.jmlsurveys.com	Scale @ A3: 1:1,000 Figure: 2 Licence No.: 20R0118 Issue Date: 22.02.2021

HOWTH ROAD

Area B

Area A

VEGETATION

TREES

EP

TRANSPORT MUSEUM

X = 727480
Y = 739330

X = 727700
Y = 739330

X = 727480
Y = 739160

X = 727700
Y = 739160

0 metres 40

Positive response ?Archaeology

Trend

Negative trend

?Modern - Services

Area of Increased magnetic response

Modern Ferrous response

Magnetic disturbance

Client: John Purcell Archaeology	Project: Geophysical Survey Howth Demesne, Howth, County Dublin	Title: Summary Interpretation Diagram	J.M. Leigh Surveys Ltd. www.jmlsurveys.com

Scale @ A3:	1:1,000
Figure:	3
Licence No.:	20R0118
Issue Date:	22.02.2021

APPENDIX 16.1

HISTORIC BACKGROUND AND APPRAISAL OF HOWTH CASTLE DEMESNE PREPARED BY CLARE HOGAN, MRIAI, MUBC IN 2020

VOLUME III

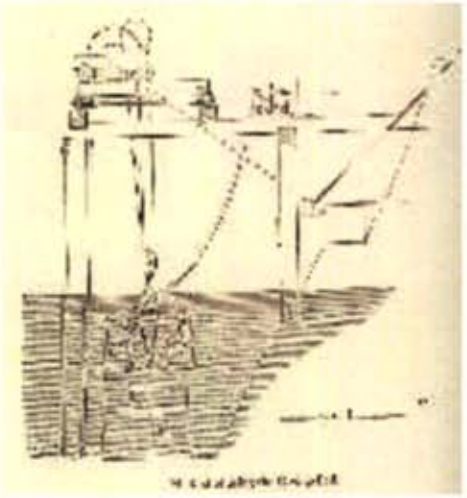
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 16.1

Historic Background and Appraisal of Howth Castle Demesne, prepared by Clare Hogan, MRIAI, MUBC in 2020

Section of Rennie's diving-bell. The diving-bell (first used in Ireland for the construction of Howth harbour) was used to build the pier head foundations



'At this point is a spacious harbour, constructed about twenty years since, but now nearly a useless work, as it is rapidly filling in with mud and sand.' Slater's Commercial Directory of Ireland for the year 1846, publ Manchester and Dublin

'This pure water on analysis proves to be equal to many of the great spas and has proved such an effective cure to those in failing health and as it contains bone forming qualities it is so indispensable for children in the important period of growing youth.' Advertisement for Howth c1900

2.0 APPRAISAL OF HISTORIC ENVIRONS

2.1 Howth village and the coast

Howth is a rocky peninsula that reaches out from the north extremity of Dublin Bay into the Irish Sea, about two miles in length, comprising an area of almost one thousand acres. It rises to an impressive height of 560 feet on the skyline, visible from all along the shore, sometimes appearing as an island due to the low elevation at Sutton Cross. On the south side of the peninsula the grand prospect of the bay sweeps for twelve miles in a continuous backdrop of hills to Bray Head. On the northern shore of the peninsula are the port and town, in the centre of which is the ruins of the Abbey of St Nessan. In Elizabethan times it was described as *'one of the largest and best towns in the country'* (E. Hogan Description of Ireland in 1598 Dublin 1878 p.37) despite by the eighteenth century still only consisting of a street running along the ridge of the cliff above the sea and along the coast beside the harbour. The census of Ireland in 1659 Sir William Petty, returned 27 persons residing in ' ye House of Howth' and 111 in Howth town.

'several fishing boats that take such fish as is usual on that coast whereof the Lord of Howth hath of every boat the choice of fish which is called the Lords Fish.' 1659 Commonwealth Census

The peninsula was isolated from mainstream city life as the journey from Dublin was costly and dangerous and a boat trip the only other option. In 1803 the Martello tower was constructed on the site of the original castle. Construction of the harbour began in 1807 under John Rennie. Leinster granite from Dalkey; Howth quartzite from the nearby Kilrock quarry and smaller amounts of Howth schist are the main rocks used in the construction of the harbour. An eminently hydraulic mortar made with Blue Lias lime, local limestone aggregate and low water:binder ratios was used below and above the high water mark. Contemporary writers described the development on the peninsula, the local inhabitants and the poverty. In 1837 Lewis identifies prominent residences and the intrepid traveler Mrs Hall - the archaeological interest *'However if the tourist will 'step ashore' at Howth, he may, before he is half an hour in Ireland, visit some of the most striking and interesting objects in the country – a ruined church, a very ancient castle, some druidic remains a village which is dignified with the name of 'town' and which is essentially Irish in its desolated character.' (Mrs Hall 1840)*

Bartlett *'..and the little town and harbour with the castle of Howth are pleasantly situated under the shelter of the hill which rises precipitously behind them. The town, or more properly the village, consists of one straggling street; the inhabitants are a rude, hardy race, the greater number of them being fishermen, who hold their cabins rent free, on the ancient tenure of supplying the lord of the manor with the best fish taken in each boat.'*

A contemporary account describes the inhabitants as ' ..a singularly hardy, healthy race of men, and generally above the common stature. Their life is a scene of privation and fatigue; after days of incessant labour, they snatch a few hours rest in the wet clothes in which they are drenched, recruit their spirits with fish, potatoes, and whiskey, their only diet, and proceed again to the repetition of their danger and toil. Till very lately they were noted smugglers, and added to the perils of this illicit calling to the hardships of their ordinary life; yet they lived to a great age, and instances of longevity beyond the age of 100 are not uncommon.'

A pamphlet written by Lord Howth depicted the town as *'Many of the houses are of a primitive description and several are in a bad state. As an owner of a town might be held responsible for the condition of its houses, I may add so easy are the rents and their collection, I am out of pocket by the tenancies under my control. My predecessor and myself built fifty one houses in the parish suitable for the poorer classes. The primitive condition of the town is fully exemplified through there being only ten civilized houses that have w.c's attached to them. The town contains practically only two streets, one the main street, which runs straight from the hill to the harbour; its great width and frequent absence of houses on both sides fully discount its shortcomings to the wayfarer.*

The street is somewhat narrow; a road has been especially constructed to cut off all traffic, and it's inhabitants are alone interested in its surroundings. Save that better lighting is required, I never remember any complaints being made in the public press of the town of Howth.'
(Pamphlet Heaven- Born Officialism, written 1894

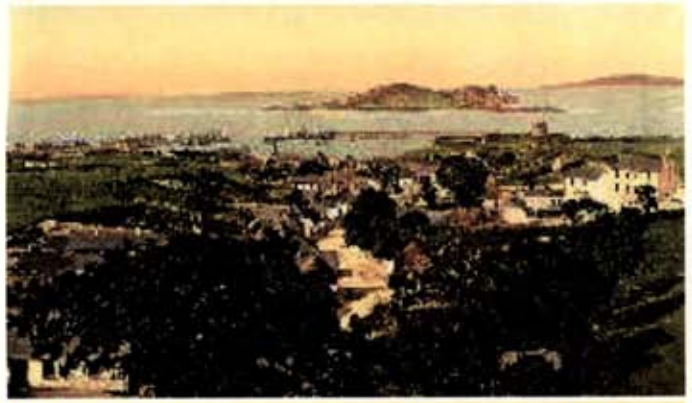
Howth was cut off from the rest of the city until efficient rail and road connections were provided. Residential development then followed the good road connection and the pattern of development from mid nineteenth century onwards was the steady appearance of summer residences on the Hill of Howth availing of the panoramic views and fresh air. The town developed a reputation as a health and holiday resort, credited with the lowest death rate in Ireland and for a while flourished as the local waters were presumed to have curative effects. Numerous hotels and guest houses sprang up to cater for the thousands of seasonal visitors. *'Howth as a sanitary resort, is much frequented by the citizens of Dublin and 296,000 or just upon 300,000 passengers used Howth (railway) station in the year 1893.'* (Howth pamphlet)

The peninsula was productive for mining. The 1837 OS map indicates eight quarries, two two gravel pits and a manganese and lime works. A lead mine close to the Casana Rock was industrially worked. References are found for deposits of lead, copper, silver, iron, manganese, arsenic pyrites and gold.

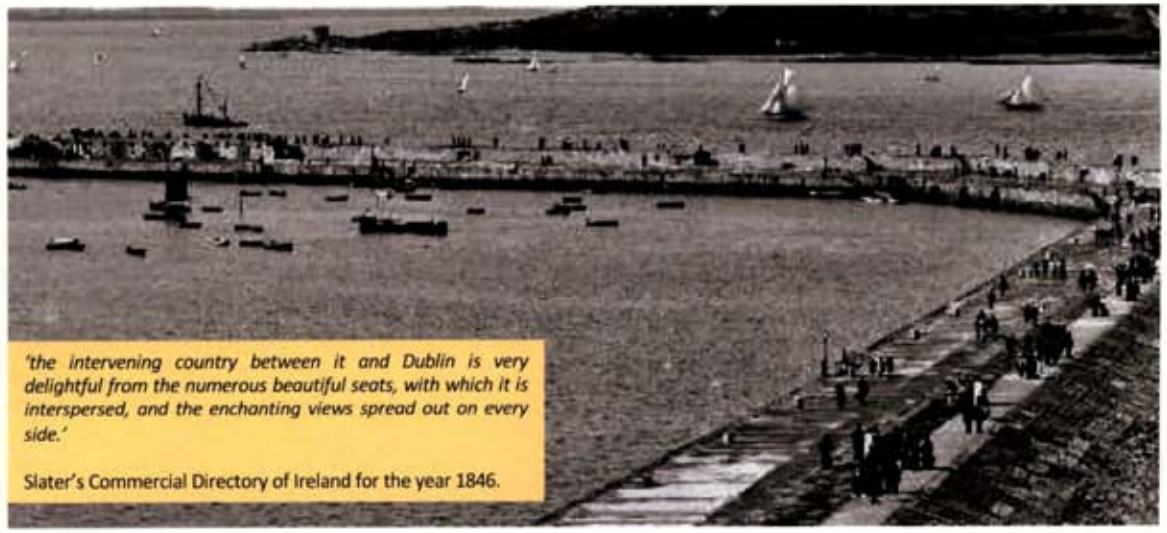
In 1914 Erskine and Mollie Childers, after sailing the Asgarde from Hamburg landed in Howth with a consignment of rifles, Following a brisk unloading of its cargo the yacht set off for Bangor in Wales. Within a week of this incident the first world war broke out and Erskine Childers and three of the crew went off to serve in the British army. The yacht was sold by Mrs Childers in 1926 and today, following a conservation programme, is on view in the National Museum, Collins Barracks.

The Asgarde

Irelands Eye is a rugged, rocky island north of Howth harbour with high cliffs on the northern edge, It possesses a Martello tower. On its west side are the remains of a chapel, built by St Nessan in 570. Three quarters of a mile in length by half a mile wide, its natural habitat included rabbits and medicinal herbs. Somewhat barren due to its exposed site, trees are non existent, however a large variety of birds species nest on the island.



'Ireland's Eye, as it is called, is a dangerous island, composed of an elevated rock, about half a mile north of Howth, and where many a mariner has met an untimely grave;' Slater's Commercial Directory of Ireland for the year 1846



'the intervening country between it and Dublin is very delightful from the numerous beautiful seats, with which it is interspersed, and the enchanting views spread out on every side.'

Slater's Commercial Directory of Ireland for the year 1846.

It was in Swift's time that the present entrance from the courtyard to the Castle, the classic doorway and the broad steps and terrace, were constructed, and uniformity in the appearance of the Castle secured by the erection of turrets and battlements in imitation of those on the ancient keep. The birds's eye view shows also that an Italian garden was laid out, and that it terminated in a canal; but before the 18th century, as will be seen from an old engraving, this garden had undergone alteration.
Francis Elrington Ball, *'Howth and its owners'* 1917

The venerable mansion, or castle of the Earl of Howth, which has been in possession of the family more than six centuries, is boldly situated on the west side of the hill, where it is particularly wooded, and commands and extensive view of the channel' Slater's Commercial Directory of Ireland for the year 1846, publ Manchester and Dublin

2.2 Howth Castle and demesne

Following the invasion of the Anglo-Normans, Amoricus Tristam (later St Lawrence) landed on the peninsula with a sizeable military force, defeated its Danish inhabitants and was rewarded with the establishment of the St Lawrence family as Lords of Howth. Initially received as a grant from Strongbow, the astute family never opposed an English king and thus held onto their lands throughout the centuries. Their first castle, most likely a motte and bailey structure, was built by the sea on an important strategic site at the present location of the Martello Tower until, in 1235 a deed references indicates a new castle built where the present building now stands. The seat of thirty successive barons of Howth, since the twelfth century, it had, until sold recently, the unique distinction of being inhabited by the same family for over seven hundred years.

The present castle structure was originally a 15th century keep or tower house. Today it is presented as an irregular, mid eighteenth century mansion flanked by square towers at each extremity and battlements. The front elevation is framed by a fifteenth century gate tower to the north and a 19th century wing to the south with crow-step crenulation. The building is a complex amalgam of phases of building and rebuilding. A tall and broad mediaeval keep is situated to the south of the main entrance range. Of mid fifteenth century mediaeval origins the former gate-tower is linked to the present entrance front with a battlemented range. A hall was added to the keep towards the end of the century along with enclosure walls and turrets. Later an additional floor was added above the hall.

In the sixteenth century the keep was extended to the north of the entrance to create the present entrance range. Between 1649 and 1671 the east wing was built.

Popular legend describes Graineuaile, the pirate queen, as returning from a visit to Queen Elizabeth the first and having been denied entry to the castle kidnapped the owners son. Part of her ransom was that the gates would never be barred to travelers. Records show that the dates of her visit to London and the age of the boy do not match up to substantiate this, but it is a good story.

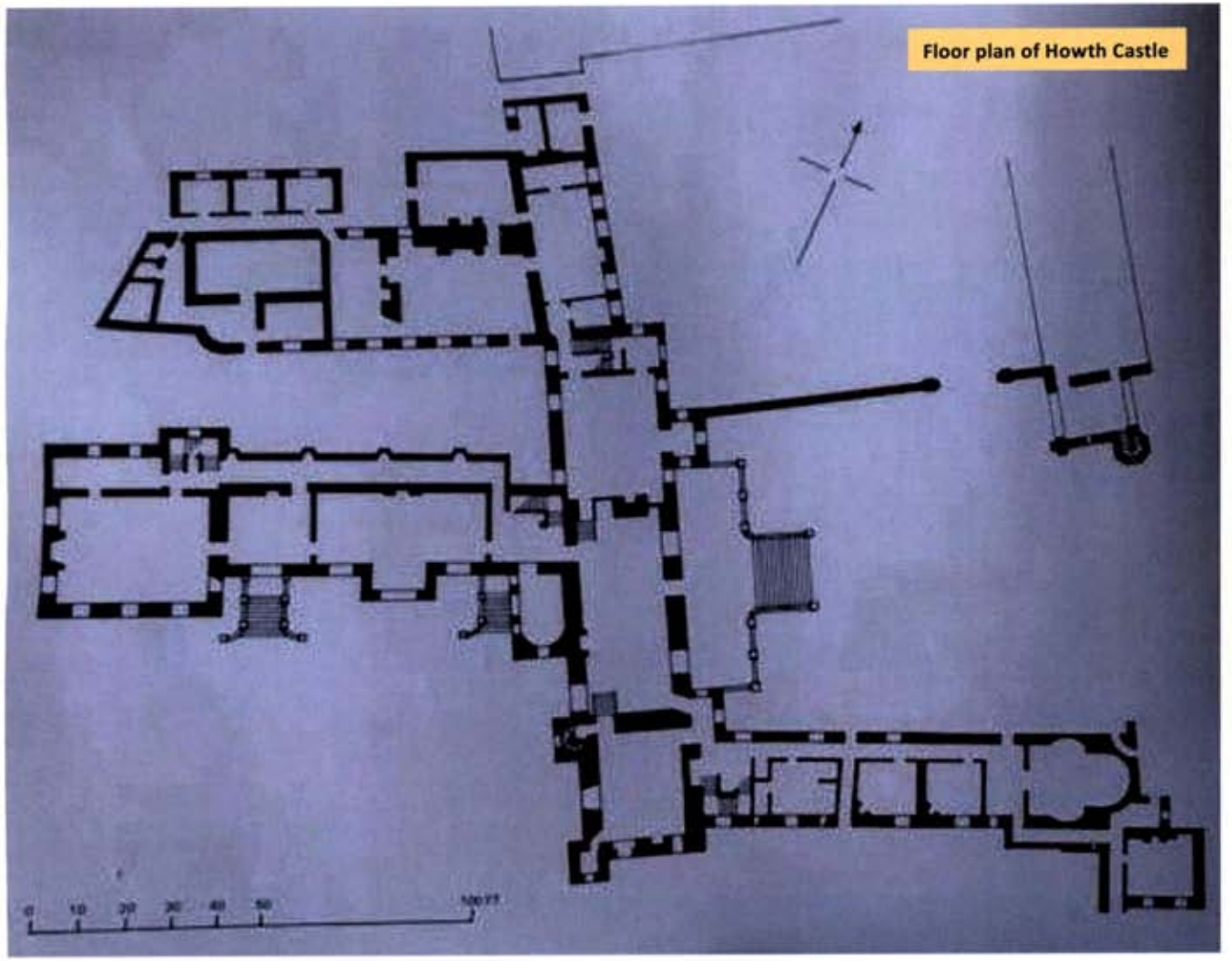
It was William, the 27th lord who transformed the castle into its present state. The front courtyard had been enclosed with wall and gate tower. This was removed and a perspective symmetry introduced with the erection of the north tower, the north and west wings, turrets and battlements similar to those on the ancient keep. The old keep was modernized and and enlarged, a classical doorway added with terrace and steps from the main front court and multi paned sash windows. Many of the farm buildings were constructed. An inscription beside the hall door reads *'The castle was rebuilt by the Right Honourable William, Lord Baron of Howth, Anno Domini 1738.'* Although there is no documentary evidence, the Knight of Glin was of the opinion that Francis Bindon may have been the architect for these works.

The battlement decoration on the original and additional structures unifies the various phases of development and the appearance of the castle including the 19th century stable range with its crenellated towers and turrets.

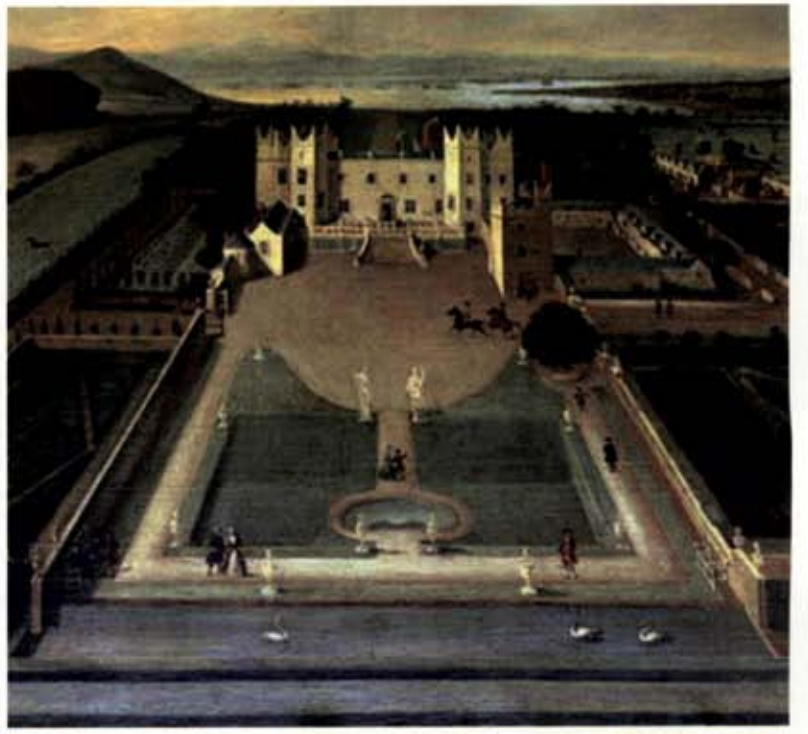
In the 1780s it was described by Thomas Milton as *' It is at present but an irregular Building, and somewhat in decay; the Hall, once the scene of revelry, is the only spacious apartment in it. The Cannon in the Courtyard are kept merely for Pleasure. Near the House, encompassed with a small Grove of Ash Trees, stands the Family Chapel, rather a modern Building.'*

In the early 1800s the round tower and turret at the corner of the stable yard were built.

' And the castle itself, which was for so many ages the residence of the noble family, retains but little of its remaining character. It has been altered at various periods according to the wishes or wants of its proprietors and with far more regard to convenience than to architectural skill and beauty. It does however, contain several interesting relics of antiquity, with, among others, the sword with which Sir Tristam is said to have won the victory at Clontarf...' Mrs Hall travelling around Ireland wrote In 1840



Floor plan of Howth Castle



'The bird's eye view 1745 shows also that an Italian garden was laid out, and that it terminated in a canal; but before the end of the eighteenth century, as will be seen from the reproduction of engravings, this garden had undergone alteration. The round pond and great 21§tree shown in the view still survive and, the former being known as Black Jack's pond and the latter as the family tree.'

'Howth Castle and its owners' 1917 Francis Erlington Ball

Howth Castle and members of the St Lawrence family

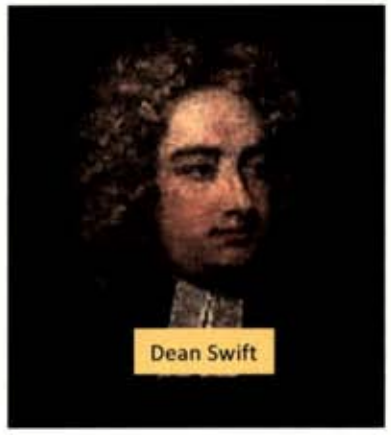
THE CASTLE FROM THE WEST

THE CASTLE FROM THE EAST

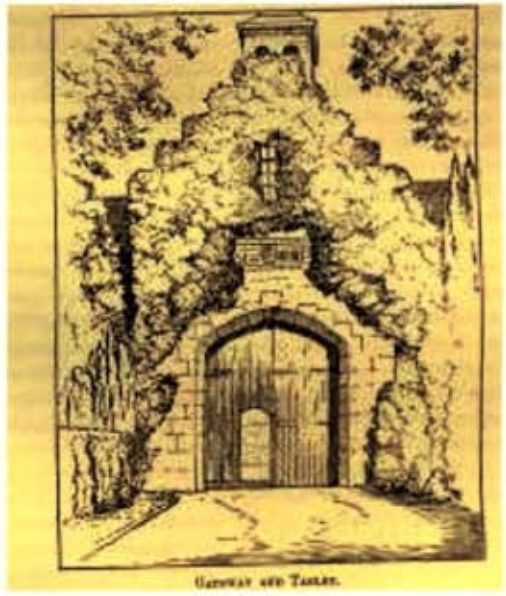
THE HALL OF THE CASTLE

Extracts from Francis Elrington Ball, *'Howth and its owners'* 1917 Part 5 Alex Thom and Co.

At the beginning of Elizabeth's reign comfort began to be considered by the owner of Howth, and a mansion was added to the ancient keep. This mansion was, no doubt, of a semi-fortified type, like the castle of Rathfarnham, which was erected some years later by Archbishop Loftus. Though probably not all occupying their original place, three tablets, which were affixed near it, still remain at Howth. They bear the St. Lawrence arms impaled with those of the Plunketts. To a daughter of that house the Lord Howth of Elizabeth's time was married, and the largest of the three tablets has, as well as their arms, their initials and an inscription: IDNS DEVS MISERIT[VR] NRI (probably standing for Jesus Dominus Deus miseritus est nostri). This tablet, which bore also formerly the date 1564,[4] is over an arched gateway, through which the stable-yard is entered from the north, and it seems not improbable that an entrance to the courtyard of the Castle was constructed in 1564 at this point to supersede the use of the vaulted passage through the mediaeval gateway tower, which afforded little room for vehicles. What portions of the present buildings date from that time cannot be determined with certainty, but the hall and kitchen appear to have been amongst them.



Dean Swift



Gateway and Tablet.

The friendship between Swift and the owners of Howth, which the great portrait of him proclaims, did not begin until William's time, and was evidently attributable to the attractions of William's wife. Swift used to call her his blue-eyed nymph, and was so captivated by her as to interfere, at her request, in the sordid affairs of the Irish Parliament on behalf of her brother, who had been defeated in an election at Ratoath, and sought to unseat his opponent by a petition. Although Swift told her, as his custom was, that she ought "to go to a writing-school and spelling-book," she wrote him three very pretty letters, which Swift, although he did not commit himself to a reply, treasured. The first of these letters, which is dated August 15, 1734, and was written from Kilfane, in the county of Kilkenny, tells of a commission from Swift to find him an easy riding-horse, and of the efforts which she had made, although only three days in the country, to execute it. The next letter, which is dated August 6,

period, which still remain. On the walls there hung a whole-length portrait of Swift by Francis Bindon, unique amongst portraits of him, in that its history is determined with absolute certainty, and nine family portraits, all, with one exception, still in the Castle, besides a pair of fine carved branches, London gilt,

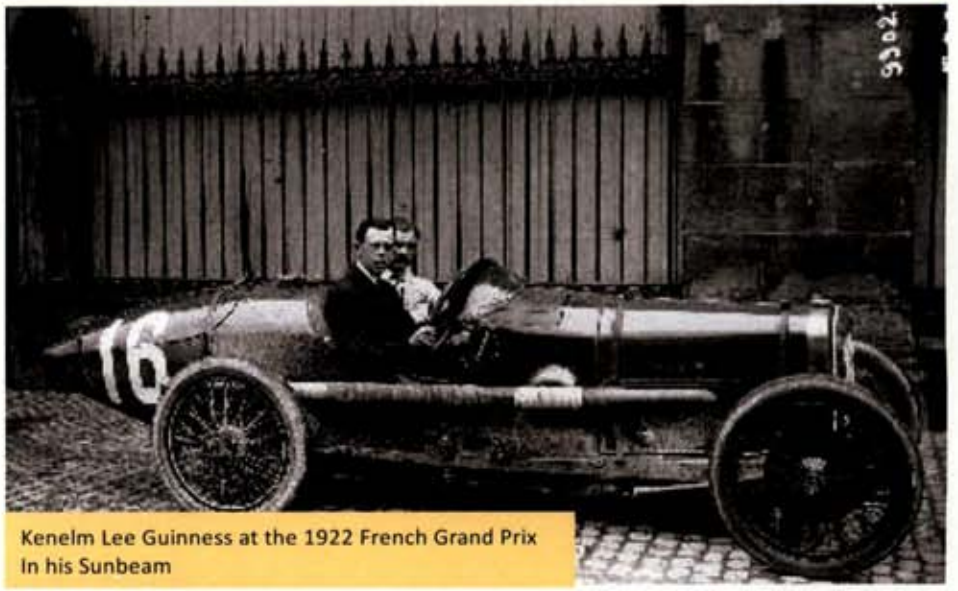
her power.' The story tells that about the year 1575, on her return from a visit to Elizabeth, Graina Uaile landed at Howth, and proceeded as far as the Castle gates, which she found closed. On learning that the gates were closed because it was the dinner hour, she is said to have expressed great indignation at what she considered a dereliction of Irish hospitality, and meeting on her way back to her ship the heir of the house, who was then a child, she retaliated, according to the tradition, by seizing him and carrying him off to her home in the county of Mayo, where he was detained until a promise was given that the gates should never be shut again at dinner-time, and that a place should always be laid at the table for a guest.

Modern research has shown that the date of Graina Uaile's visit to Elizabeth's court was eighteen years later than that assigned to it in the story,' and the story has been therefore deemed to be unfounded. But without direct evidence to controvert it, tradition should not be lightly set aside, and the possibility that an incident such as the tradition relates may have occurred

THE CASTLE *circa* 1820

The family elm tree seen to the right hand side of the front with a stone seat at its base.

Kenelm's Tower at Howth Castle and below the Sunbeam driven by Kenelm Lee Guinness to land speed records and later by his friend Malcolm Cambell as Bluebird



Kenelm Lee Guinness at the 1922 French Grand Prix
In his Sunbeam

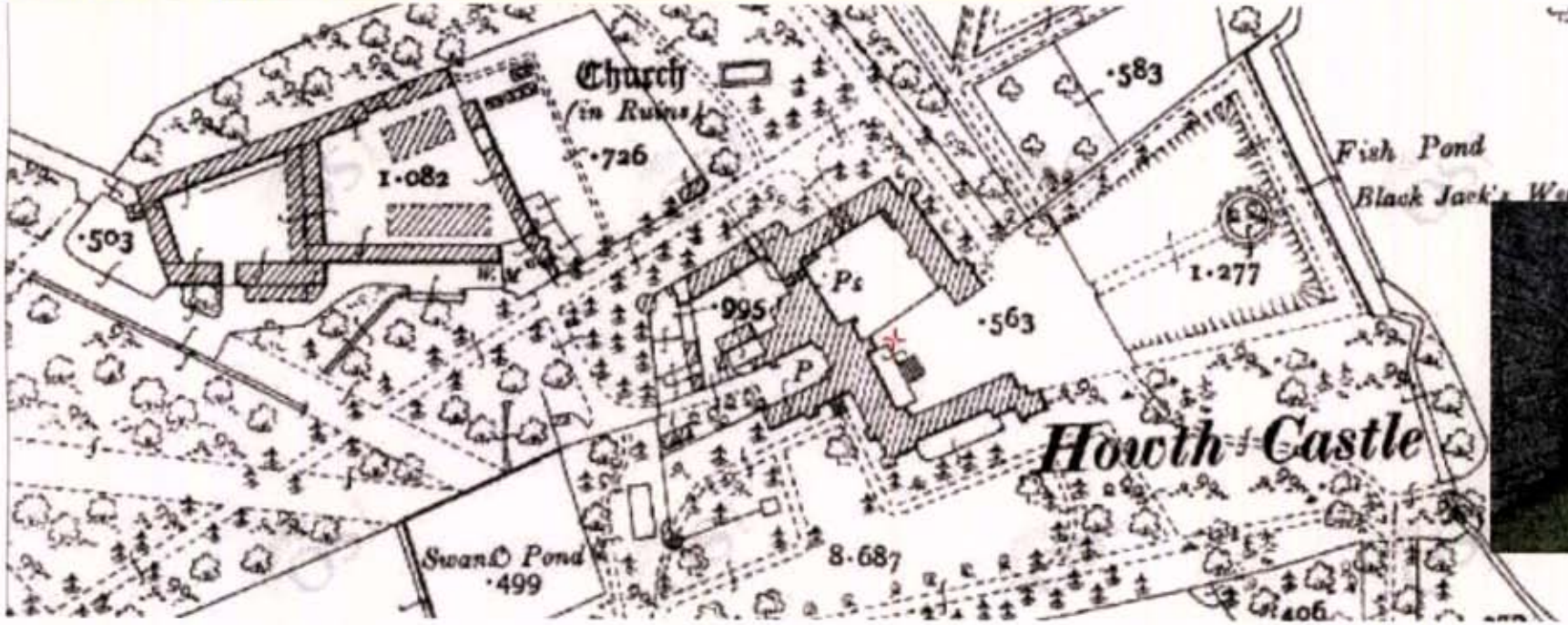
Lady Henrietta Lawrence, daughter of the third earl married Benjamin Lee Guinness and their son, born in 1887, was christened Kenelm Lee Guinness. Following his birth an old round enclosure turret at the end of the weast wing was renovated and and a square tower built up named Kenelm's Tower.

A talented Formula One racing driver Lee Guinness broke the world speed record. He also invented and manufactured the KLG sparking plug. Experience in racing competitions had revealed weaknesses in the efficacy and efficiency of the spark plugs in use at the time. Until about 1912 variants of porcelain-insulated spark plugs had performed reasonably well, but the advent of smaller, higher revving engines demonstrated the deficiencies in their overall performance. Lee Guinness experimented with various materials and eventually discovered that mica-insulated plugs were a distinct improvement on their predecessors. When the mica was stacked in sheets and compressed by the central electrode being tightened on a thread, a more effective performance was achieved. A patent was obtained in 1916 for mica-insulated plugs for use in aero engines and such was their reliability that by the end of the war they were extensively used by the RAF. His initials, KLG was registered as a trade mark in 1918. KLG spark plugs were used in the majority of motoring, motorcycle or flying achievements in the inter-war years. They were inserted into several hundred special engines and in two cars which broke world speed records including Sir Henry Segrave's Golden Arrow and his friend Malcolm Campbell's Bluebird.
In May 1922, in a Sunbeam, he set a new world record over a measured distance at Brooklands, with a mean speed after covering the course in both directions, from a standing start, of 133.75 m.p.h. On 20 September 1924 he won the Junior Car Club 200 mile race at Brooklands in a Talbot-Darracq. A week later, driving a Sunbeam at the San Sebastian grand prix, momentarily distracted, he was involved in a crash which left him unconscious with head injuries for several days. His riding mechanic, Tom Barrett, was killed. Lee Guinness was badly affected by his death suffering depression and eventually suicide in 1937.

Left : Lady Henrietta Guinness nee Lawrence
Right : The KLG spark plug

OS Cassini map below. The stable yard was located to the north west of the main castle building with an avenue leading past the northerly edge to the extensive farm buildings which have been largely replaced with modern buildings and are now in use as the transport museum. The round tower and the turret at the corner of the stable yard was built by the second or third earl.

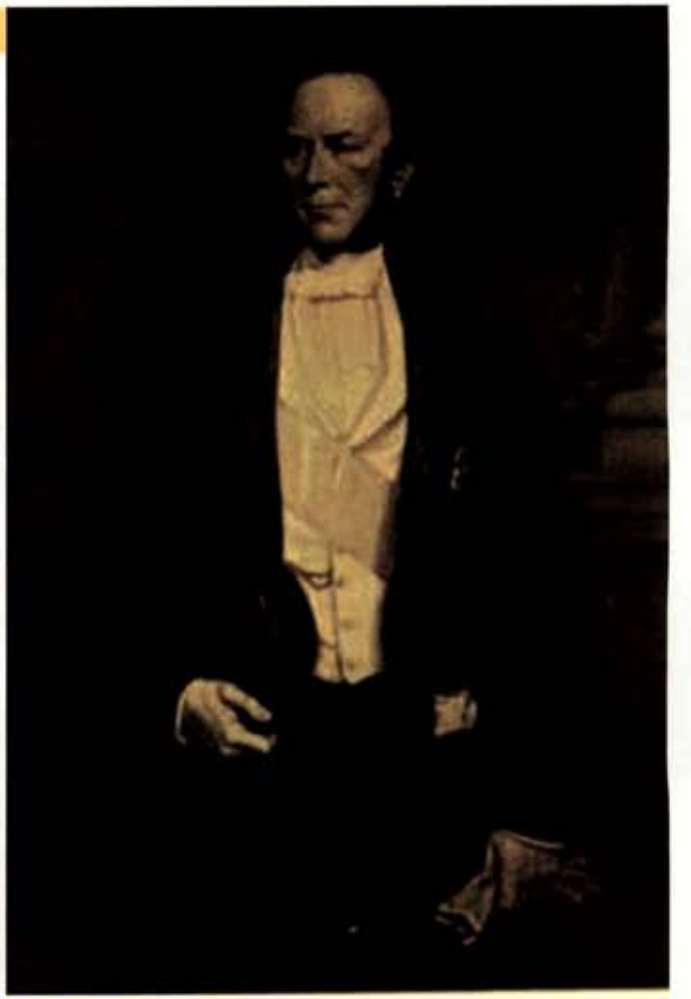
Clockwise from left above : Farmyard buildings, now transport museum
Centre : buildings within the farmyard Right : Stable buildings
Below : Round turret of the stable yard



Extracts from Francis Elrington Ball, *'Howth and its owners'* 1917.

But it is as a sportsman that the third Earl of Howth enjoyed most celebrity. His death was said to have left a gap that would never be filled, and to have revived recollections of glorious days in the history of the Irish turf. His love of horses was lifelong, and in his early years he was recognized as one of the best and most determined riders in the United Kingdom. A German prince, who visited Howth in 1829, found the castle stables and kennels full of noble hunters and notable hounds, and relates how he followed Lord Howth throughout a stag-hunt, of which not many saw the end. Pavo in the "Morning Post" applauded Lord Howth for the example which he set on the turf, and said that a better judge of a horse or of racing never breathed. He pictured him as a fine horseman, with a powerful, although light, figure. In England, as well as in Ireland, Lord Howth's colours, white body with black sleeves and cap, were often successful. In 1842 he carried off, with *St. Lawrence*, the Stand Cup at Liverpool, and in 1848, with *Peep-o'-Day Boy*, the Chester Cup. The Warwickshire Hunt Stakes fell to him with *Crossbow*, and the March Stakes at Goodwood with *Beatrice* and *Wolf-day*, while from Foxhalls he bred *Kingstown*, *Mince-pie*, and *Ashworth*, which gained for other owners classic honours. In Ireland, at the opening meeting of Baldoyle Race-Course, which he established, he won the first race with *Lenboy*, and carried off also the stakes in three other races.[1]

The third Earl of Howth was twice married. His first wife, whom he married in 1826, was Lady Emily de Burgh, daughter of John Thomas, thirteenth Earl of Clanricarde, who died in 1842.



Clockwise from top
Thomas, third Earl of Howth in the hunting field
Thomas, third Earl of Howth
Peep O'Day Boy, whose winnings paid for the Morrison gateway

Demesne landscaping

In 1892 Rosa Mulholland referred to the grounds thus: *'Back on the lower land you must visit the ancient demesne of the Earl of Howth, where a quaint old castle stands in a prim garden with swan-inhabited pond, and splashing fountain, encircled by dark beautiful woods full of lofty cathedral-like aisles, moss carpeted, and echoing with the cawing of rooks.'(Mulholland 1892: 35)*

Above : The front façade of Howth Castle
Below : The demesne wall enclosing the site of the proposed development as seen along the Howth Road

2.3 Demesne landscaping

The name demesne refers back to the 'domaine' of the Anglo-Normans and is a generic title that covers the majority of historic lands attached to the Big House. The definition is *'all the land retained by the lord for his own use'* as distinguished from that *'alienated'* or granted to others as tenants. The demesne normally contains the full extent of the ornamented landscape. There are over 6,000 demesnes and landscaped sites surviving in Ireland.

The demesne normally contained the ornamental gardens, productive garden. park, woodlands and farm buildings associated with the house. The layout of demesnes for persons who avidly enjoyed shooting included woodland for the rearing of game along with gardens for leisure purposes. New roads, big houses and enclosed demesnes resulted in a realignment of the Irish landscape replacing earlier tower houses, bawns and small clusters of hamlet dwellings. Demesnes could be enclosed by either strong stone walls or prickly hedges. Stoutly enclosed deer parks had been a feature of castles since mediaeval times and fox hunting had become formally established by mid seventeenth century with demesnes like Howth providing ideal ground cover and hunting areas.

Decoration was provided by the flower planting and the less permanent features. The traditional walling material for the enclosing demesne wall was usually selected for ease of supply. Field stones and the local quarry providedl a cheap and convenient building material

In 1728 ' The Geographical Description of the Kingdom of Ireland' survey found that of the 600 acre demesne in Howth – 300 were arable, 200 pasture, 20 meadow and 80 rock. *'one fair mansion, two castles – the keep and gateway tower- one stable, one barn, one dove house and several other office-houses of stone slated, together with the walls of a decayed chapel'*

In describing a landscape, the 'structure' includes significant landform, boundaries, plantations, drives, walks, gardens, buildings, views, vistas and focal points which define how the landscape is seen and appreciated. The structure of parkland is largely defined by woodland blocks and the spaces left between them, both by way of defined vistas and more substantial blocks of open land as can be seen to the east of the castle at Howth. Along with gardens and lawns for ornamentation and leisure purposes the layout of the Howth demesne included a race course located within the original deer park.

Howth Castle was a family seat and described as an estate (a holding in excess of 500 acres). It possessed many of the typical landscaping elements introduced by the discerning landlord and 'improver'. To begin with it had the advantage of a particularly wild and rugged natural setting, benefitted from stunning sea and mountain views as well as providing height to open up panoramas in all directions. Along with this natural beauty a sequence of intended 'events' to be enjoyed by the visitor was one of the key elements introduced into the landscaped design. To achieve this avenues or walks were established between trees and across parkland allowing them to take advantage of these experiences. The circulation through Howth demesne can be seen on historic maps and these historic routes are of heritage interest.

Demesnes came to symbolise the overt economic and social power of the landowning class. They dominated developments in the Irish landscape for centuries until, following the collapse of the estate system, they lost their social and economic role and in due course the dwindling fortunes of the St Lawrence family led to the necessity to sell off lands piecemeal at the perimeter of the estate. A combination of the first world war and the Easter Rising accelerated the decline of many estates and land was divided or sold off piecemeal, frequently around the boundary of the demesne. At Howth the classical landscape was substantially modified to make the Deer Park golf course and the Deer Park Hotel. The spectacular natural landscape and views remain. The rhododendron gardens under the shelter of Muck Rock and the rugged scenery and marine location are still the setting of a unique and significant castle.

The landscaped structure survived into the early twentieth century as demonstrated on the OS Cassini map

2.4 Landscaped pleasure garden

The pre-eminent gardens of the seventeenth century were French, reaching their full glory with the achievement of Versailles. Their aim was ceremonial grandeur and a desire to impress. Following 1660, with the restoration of Charles II to the throne of England, this influence could be seen in the introduction of great formal landscapes characterised by avenues, expanses of grass and water features. Irish estates developed during the Caroline (1625-1649) era followed by Williamite wars (1689 -91) were ornamented with pleasure gardens, deer parks, decoys, bowling greens and water works.

Collections of garden design manuals were common in England but none were published here. Samuel Chearnley's unpublished 'Miscelanea Structura Curiosa (1745) contains designs for garden buildings under these headings : Ruins, grottoes, surprises, cascades, fountains, bridges, obelisks, columns, terminations for vistows, temples, triumphal arches, chimneys, monuments. Design of pleasure gardens were usually rectangles or squares intercepted with gravelled walks and sometimes lined with box hedging. Radiating avenues led off into the distance occasionally on axis with the local church. The styles ranged from refined classical to grotesque rustic work. Lutyen's Sunken Garden, the Sidney Garden, and Swan Pond still survive as features of the private gardens immediately adjoining Howth Castle.

At Howth, the demesne was richly wooded, and included a spacious and well-stocked deer park. Hedges of beech, 20 feet high and 6 feet thick and 2000 species of rhododendron made the gardens famous. The lands were laid out to accommodate healthy past times – walking, riding, fishing or hunting and the situation provided very beautiful views. Bosquets of trees, tree lined allees and wilderness directed to chosen views.

Significantly the parkland and its woodland were also required to be productive landscapes, used for grazing and timber growing. Apart from the feeding of large households benefits included a source of income, providing vegetables and wildlife. The herds associated with parkland, as well as the kitchen gardens were all part of the productive value of the estate.

In 1892 Rosa Mulholland referred to the grounds as: *'Back on the lower land you must visit the ancient demesne of the Earl of Howth, where a quaint old castle stands in a prim garden with swan-inhabited pond, and plashing fountain, encircled by dark beautiful woods full of lofty cathedral-like aisles, moss carpeted, and echoing with the cawing of rooks.'*Howth Castle is not unusual in having lost most of the original design for its pleasure gardens. Very few late seventeenth and early eighteenth century gardens have survived. The estate previously included much of coastal northern Dublin, including the lands of Kilbarrick, Raheny and parts of Clontarf but these were gradually sold off from the mid-19th to the mid-20th century. However two documents give us a very good idea of the original layout – The Rocque's map of 1756 and the birds eye view from 1740. The layout of the pleasure gardens at Howth featured formal walled gardens grouped close to the entrance front and main avenue castle with the trees to the west just about visible above the roofs of the castle. A formal avenue between the trees gives a framed view of Sutton Creek and Dublin Bay.

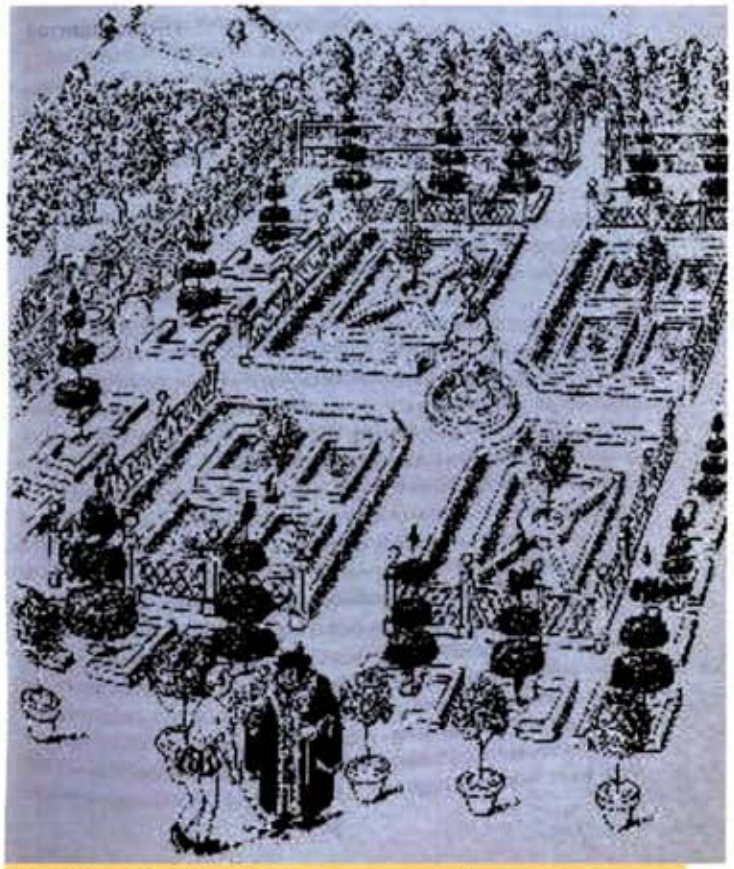
Depictions by Osbert Lancaster of gardening styles similar to those incorporated within Howth demesne over the years
left : Parkland
Right : Tudor and Jacobean style with water feature

Formal gardens

The gardens at Howth, dating onwards from the end of the seventeenth century, can be seen, from the historical maps and the bird's eye view, to have followed the precedent of enclosed logical shapes and gravelled walks migrating out into the park as fields, rides, plantations and ultimately the rocky backdrop of Howth hill.
The formal garden side was given its structure with straight walks bordered by walls, trees and shrubs that formed compartments grouped tightly around the castle. Topiary seen in the view had, by 1740 become unfashionable and was more associated with the Dutch style of gardening. It's retention may have been interpreted as a demonstration to the Protestant House of orange. A circular pool, known as Black Jack's Well, set in lawns, was placed on axis with the main entrance leading the eye to swans swimming up and down a rectangular moat. Central and flanking gravel paths provided walks to benches placed strategically against the walls. Statues adorned the walks and seating against the enclosing walls provided 'places of repose'. The walls either side of the walks were continued into the moat affording a measure of security.

A large gravelled court was provided to the entrance front in order to enable the lumbering carriages of the period to turn around. The walled garden to the south of this central element is laid out as formal garden and to the north a more productive garden has as a centrepiece, a pitch roofed summerhouse. The Family elm planted in 1585 was the oldest imported tree in Ireland. A prediction was made that when the last branch fell the title would become extinct. Despite extensive propping to postpone this event the tree succumbed and in 1909 the ancient title died out with the estate devolved to a nephew of the fourth and last Earl. The stables are seen to the side of the fifteenth century gate tower with the farm buildings further from the main house toward the sea. Surrounding the more formal landscaped features are fields enclosed by hedges. While some landscaped elements depicted in this painting survive to the present day, it is a painting and is not an exact representation of the demesne in the mid 18th century.

Rocque's Map produced in 1756 would be a more accurate depiction and illustrates the house and gardens after the building works carried out by the 14th Lord Howth as well as the formal classical gardens surrounding the house. The wall enclosing the gardens to the left of the house was not built. Beech allees, reputedly the highest in the British Isles, led from the castle walls to views out over the sea to Ireland's Eye. Rocque's map illustrates the composition of the goosefoot or patte d'oie pattern radiated out from the south western front of the castle and linked by traversing to form elaborate star shapes.



Traditional formal garden layout surrounded by tree planting as shelter as depicted by Osbert Lancaster, note kelps located to the left of the illustration

As late as the mid-20th century, there was a rock garden near the Church of Ireland parish church, a 'sundial garden' near the main entrance gate, an orchard and a moat and the site of a well or spring in front of the castle; all of these features later fell into disuse. A small sunken garden introduced by Lutyens introduced a typically English herbaceous border on the south side beside the castle's chapel wing, and a formal garden behind it, with a walk cutting through to the Swan Pond, beside which was a fern garden.

In 1919 Sir Edwin Lutyens, who was employed by Julian Gaisford, worked on Howth castle and its gardens. He laid out a formal sunken Dutch garden on the south east front sheltered by his tower with typical stepped battlements that formed a terminal at the west end of the castle. This was in the formal Early English style with stone flagged paths, box edging and formal beds raised above the walk so as to better exhibit the flowers.

A smaller, formal garden called after Lady Sidney, eldest daughter of first Earl, was located between the Swan pond and the castle and planted with hardy summer and autumn flowers, including lavender, paeonies, rosemary, agapanthus, and a large Buddleia Colvilei. Two of the walls were part of the original defensive stockade. A walkway led through to the swan pond and fernery.

Formal garden by Lutyens

Avenues, walks and rides

Avenues, planted long and straight for effect and cutting through forests for hunting pursuits, distinguished the late seventeenth and early eighteenth century Irish estates. They permitted the visitor to walk leisurely through the estate viewing the variety of timber without tripping over the undergrowth. They were an indication of the ownership of the lands, designed for aesthetic reasons and visual purpose, frequently to focus on a distant view or specific topographical feature. At Howth Rocque's map shows an avenue cut through woodland directly on axis with Corr Castle. In addition to their useful or decorative function they created shelter belts for the more tender plants. These avenues were usually given names not unlike the practice of road names today.

Pattes d'oies as seen on the Rocque's map at Howth were linked by placing two or more around a circle to form elaborate star shapes. Howth also followed the fashion for prolonging the axes of the garden into the surrounding countryside. They are shown leading from the formal gardens to the wilder landscape of Howth Hill and the rhododendron covered hill of Muck Rock, skirting by enclosed fields. Secondary avenues had a more practical purpose providing the main approach to the house or connections to ancillary buildings. The demesne was also cris- crossed with ancillary avenues leading to the entrances of the estate and for practical farming purposes.

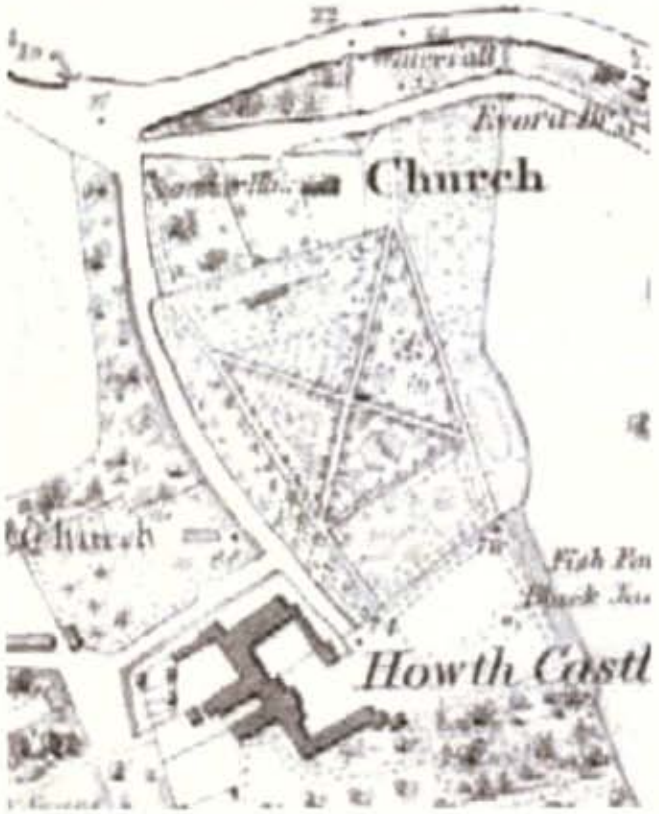
The avenue as the approach leading to the castle is a familiar feature of the big house and one of the features most likely to have survived in an Irish estate. At Howth the maim approach avenue lacks a vista to the castle from the main gates. Lined with Irish yews, it gives little indication of what lies ahead as it curves eastwards to skirt around the ruins of a medieval chapel. The Irish yews were planted by the third Earl in 1865. It follows the boundary of the walled gardens and stables before approaching the house from the side at the mediaeval gate house. A secondary avenue branches off towards the home farm. The avenue that approaches from the gates to the entrance courtyard is lined with Irish yew planted by the third Earl in 1865. To the left of the avenue is the Beech Hedge Garden which had a beech walk 600 feet long planted in the seventeenth century that led through the sundial garden to the Harbour walk. The hedges 200yards long and 21ft high were planted at the beginning of the 17th century.

'Avenue' was a term gradually broadened to include 'rides' and 'walks'. Most ancient parks were covered with old trees and were suitable for rides intersecting at a rond-point in line with French wooded hunting preserves.
Walks held different roles within the hierarchy of garden design and the principal walk was usually intended to face a building, pavilion or similar or similar eye catcher. At Howth an ornamental pond with gravelled walks and statues was created on axis with the steps and terrace to the front entrance. To the rear of the castle angled walks branch off the axial vista to explore the park and its views.

Rides were created throughout the demesne and up rocky bridle paths, lined with primeval oaks and ancient holly, one led to the cairn at the summit of the Hill of Howth with views south over Dublin Bay or North to the mountains of Mourne.

Clockwise from above : Woodland walk.
Lancaster depiction of intersecting walkways in fashionable gardening,
yew lined walk along the walled garden of Howth Castle

Walled Garden



There is an element of surprise entering a walled garden but generally the walls create a peaceful character. The traditional design was split into four quarters separated by paths with a well head or pool at the centre, dating back to the very earliest gardens of Persia. There were circa 7,000 walled gardens in Ireland. From earliest times until the eighteenth century Irish gardens were confined within enclosures, generally keeping livestock in and people out. Amongst the oldest is at that of Lismore Castle in Co Waterford which was acquired from Sir Walter Raleigh in 1626 by an ancestor of the Devonshire family and although the planting has changed the original outer walls and terraces survive. Sir Walter is said to have brought wallflowers from the Azores and tobacco plants from America and grown them in the walled garden of his Elizabethan house at Myrtlegrove in Co. Cork.

This enclosed, formal style of gardening was already established in Britain during the first century, courtesy of the Romans. Perhaps because they called Ireland 'Hibernia" (winter) they were not tempted to visit and it was the early monastic settlements, many established in the sixth and seventh centuries, that introduced the concept of Roman gardening techniques and plants. These followers of St Patrick had both the knowledge and organisation to create Physic gardens, orchards and kitchen gardens and brought seeds from the great schools of learning on the Continent. Its traditional rectangular shape ensured a maximum length of south facing wall. Gravel paths were used for walking routes and often the beds were lined with box. Dwarf fruit trees, low fruit bushes and espaliered fruit trees beside the main walks were common from the seventeenth century onwards.

The great pleasure gardens provided an aesthetic veneer for what was in effect a façade for a very utilitarian purpose. In particular the walled gardens provided fruit, vegetables, herbs and cut flowers for the large household. It produced the food required by the household from the kitchen garden using rational planning from the perceived tradition of centuries. Kitchen gardens also contained buildings for a specific purpose and general use. Hot houses, hot beds, frames, stoves and green houses accommodated a wide variety of plants and an orderly layout with different degrees of warmth. The kitchen garden provided an uninterrupted supply of fruits, flowers and vegetables for the Edwardian country house lifestyle. One acre was expected to produce enough produce for twelve people. Whilst a great estate might employ hundreds of gardeners and contain huge growing areas under glass, it was not uncommon for people of comparatively modest means to employ half a dozen gardeners. The mild microclimate also provided a sheltered setting for the tender shrubs and bedding plants popular in the late 19th century.
A garden house was required for tools and seeds.

The greatest expense (apart from hothouses) was brick walls. Walls were usually 10ft high (up to 20 in large gardens) as protection from thieves, to create a micro climate within and as support for plants and buildings. The walls at Howth do not have the supporting piers which were often found on the outside so as not to interrupt the runs designated for training fruit. Entrances were minimised as the walls were the greatest asset of the garden. Stone walls were common as they were cheaper as material available locally but they were also chilly and damp. They were sometimes lined with brick on the garden side – strong, dry and heat retaining and made nailing easy through the mortar joints.

Between the 1880's and 1912 the walled garden reached its peak while gracious living continued in large houses until the start of the first world war.

'All my choice plants are gone. As for the fruit trees, they have been so completely mismanaged that I doubt their ever recovering it! Pines and grapes are out of the question for a long time to come! I conceive the greatest part of this injury must have been done on purpose!'
Lady Georgiana Longford from Tullynally Castle 1841


Fota


Powerscourt

Examples of walled gardens with paths, vistas, herbaceous borders and seating arrangements.

As the Tudor pleasure garden came into prominence, these were increasingly designed for ornament and as a means of showing off. The basic shape was a square walled or fenced plot was divided into quadrants and this could be adapted to suit small manor houses or elaborate palaces like Hampton Court. The great estates had a spatial hierarchy with the pleasure garden and kitchen garden located close to the house and the distinction between the purely aesthetic plants and the useful became increasingly blurred. For smaller houses the walled garden was particularly promoted by plantsmen. John Rea in his *Flora, Ceres and Pomona* (1665) detailed the different sizes required for fruit and flowers in an enclosure surrounded by a brick wall nine feet high, with a stove-house for tender plants and orange trees.

While Henry VIII was sending his gardener over to Fontainbleu to study Renaissance ideas, Ireland, due to political instability was still building houses in the defensive manner until well into the 17th century when the post-Restoration period saw landowners developing demesnes and gardens, making their landscape productive as well as aesthetically pleasing. An early example, the tower house of Lemaneh Castle had been remodelled into an open manor house with an elaborate pleasure garden by the end of the century. Kilruddery, whose formal garden was laid out in the 1680s included'...pleasure garden, cherry garden, kitchen garden, new garden, wilderness, gravel walks..."

The walled kitchen gardens of Ireland evolved over four centuries. Associated features usually included frame yards, slips, orchards and forcing grounds, together with hot walls, ranges of glasshouses (vineries, peach houses, cold frames and pits), boiler and coke houses, potting sheds, a variety of fruit, vegetable and root stores, tool houses and staff accommodation.

By the eighteenth century the positioning of flower and useful gardens was usually kept well away from the house, hidden from view behind sheltering walls and tree planting. However the walled gardens in Howth are located close to the castle, as befitting earlier origins. In design layout they did not follow the classical and practical four square plan.

By 1840 the vast majority of the country's landscaped parks (over ten acres) had been created. Some were attached to modest houses and vicarages. They numbered approximately 7,000 and equated to 4 per cent of available land. The smaller and medium sized tended to be located clustered around urban centres. Serious interest in flower gardening caused a revival of the walled garden from its position in some obscure part of the estate back to the house. Mass production helped fill them up with balustrades, statues and fountains. The newly acquired money of the Victorian industrialists favoured conifers, exotic foreign plants and green houses heated with circulating hot water 'a garden for displaying the art of the gardener'. In 1845 the glass excise tax was abolished enabling the wealthy to build large greenhouses against their south-facing garden walls.

The enclosure of the walled garden at Howth remains, that which once housed a Beech Hedge Garden set out in the 17th century. The early historic maps indicate that the walled garden once had a more elaborate layout with an orchard, beech hedge, garden house and sundial garden. However, the centre of the walled garden has been cleared and most of these elements no longer exist with just some trees remaining along the edges of the interior. Stone gate piers with iron gates provide access into the garden from the main avenue. There is also a pedestrian gate opposite the front courtyard, which has a small plaque set into the wall.

Fruit trees trained along brick walls and woven straw beehives which were known as skeps, were located in the orchard. The beehives can be seen in the bird's eye view of Howth Castle. The productive gardens required extensive watering and this would have been provided from the Bloody Stream.

The larger walled garden shown on the historic maps was generous and shows the layout of the formal beds. Adjacent to this garden another substantial walled garden is indicated. A building is indicated against a south facing wall within the walled garden. It may have been an orangerie, useful for the provision of more exotic fresh fruit or flowers, as it is shown as the focus of pathways.

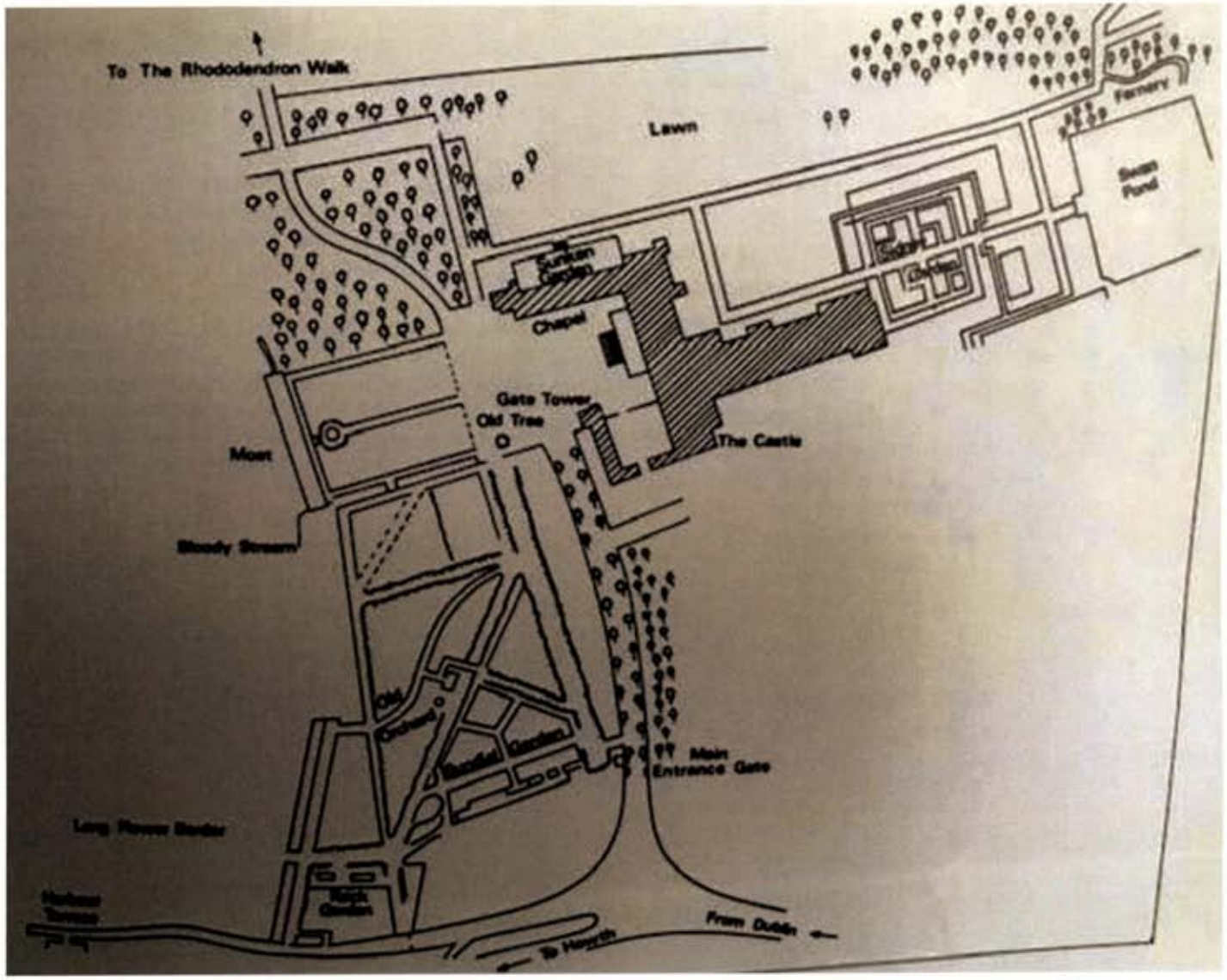
The westerly aspect would have provided ideal conditions for pleached fruit trees, invariably found in such a garden. The walled garden provided flowers for enjoyment, food for the table, preserves for the larder and herbs for medicinal uses. Stone gate piers with iron gates provide access into the garden from the main avenue. There is also a pedestrian gate opposite the front courtyard, which has a small plaque set into the wall. There is a considerable difference in levels between the castle forecourt and the lower ground level of the walled garden.

Part of the walled garden was laid out as an orchard with walks leading to the Long Flower Border, rock garden and superb views of Ireland's Eye.

There was a Heath Garden with palms and Irish heath growing under three blue gum eucalyptus trees. A pond was fed from the moat via an underground duct.

The gardens contained a sundial garden and fernery. The long Flower Border was planted with lavender designed to provide flowering throughout the year.

The Pleasure Ground located beyond Kenelm's tower has trees planted by the Duke and Duchess of York during a visit to the castle, near Lutyen's sunken garden. Lady Sidney's garden, located between the swan pond and the castle, was named after the eldest daughter of the first earl. Two of the enclosing walls were part of the original defensive stockade of the castle.



Castle and garden plan Howth c.1930 from *Irish Houses and Castles*

Ornamental garden buildings

Gateway to walled garden

Views and vistas

In the construction of the walled garden only the gateways exhibit more considered architectural detailing and the gates feature delicately decorative wrought iron. The 3m high walls provided a wind break and the construction raised the temperature within by a few degrees and then retained the heat. The walls allowed the training of fruit trees and made it easier to protect from birds and the old walls are liberally pock marked by nail holes, evidence of the constant adjustment needed to train the wood of growing trees and plants.

Part of the challenge today is the sheer size and scale of the average Irish walled garden which makes maintenance a big issue. These gardens were designed in a very different era, when materials and skilled labour were cheap. It takes time and knowledge to fan-train a pear tree, or to keep glasshouse-grown plants watered and happy.

The description from the Architectural Conservation Area report states that : 'On the east of the main avenue is a walled garden. The early historic maps indicate that it once had a more elaborate layout with an orchard, beech hedge, garden house and sundial garden. However, the centre of the walled garden appears to have been cleared and most of these elements no longer exist with just some trees remaining along the edges of the interior. Stone gate piers with iron gates provide access into the garden from the main avenue. There is also a pedestrian gate opposite the front courtyard, which has a small plaque set into the wall.'

Garden building were intended to create an architecture of either memory, escapism or fantasy. According to Alistair Rowan "their only function is to be attractive. Their aim is to give delight, and for this reason the degree of their attractiveness is the only true measure of their success.' These buildings or 'pleasure houses' provided shelter for dining or seating in appropriate places throughout the garden. At Howth a high pitch roofed garden house was placed in the centre of the formal gardens and can be seen in the birds eye view.

The image and character of a historic estate depends on views, topography, building forms and major landscape features. Views can be either composed or wide and panoramic and were included as part of planned landscaping since the late 18th century. They are typically associated with a romantic setting. Of Howth Castle, whose natural setting was defined by the high peninsula and the sea, narrow and highly composed views from the principal building and selected viewing points have been identified from engravings and historic maps.

Part of the garden design seen on Rocque's map indicates vistas across the wide lawns, across the meadows from Howth toward Ireland's Eye and Lambay that are framed by beech hedges planted c 1720. A view of Corr Castle was created through the densely planted trees west of the castle. The harbour terrace provided a view of Howth Harbour and Ireland's Eye .

'The castle was built on a site with exceptional, panoramic views.' Lewis

The ACA has identified significant views *'The principal views of note within the boundaries of the ACA are of Howth Castle itself. There are some views out of the ACA, namely from the entrance gates and from the castle over the golf course. These views contribute to the character of the area and it is important that potential new development within the ACA does not negatively impact on or obscure these views.'*

A historic view from Muck Rock *'From a bridle road leading to the summit of the hill is a fine panoramic view of the bay of Dublin with the numerous seats and villas on its shores, backed with the Dublin and Wicklow mountains.' is seen* on the Bartlett engraving.

View from inside the main entrance gates across Howth Road to the Techcrete site, with sea in the background

Woodland

Tree planting was a symbol of the landlord class that particularly flourished from the end of the eighteenth century until the mid nineteenth century famines. Encouraged by the Royal Dublin Society, the patron of tree planting, improving landlords planted one third of a million acres of hardwoods.
The woods at Howth were man made. Located west of the castle they were laid out in the French *foret ornee* style with axial avenues cutting through the trees and a boundary walk separating the designed landscape from the countryside. Apart from ornamenting the estate the woods shielded the castle and produced income. The main activities associated with trees are cutting, thinning , burning and planting of exotic species. On the deep soil of the lower slopes of the hill oak woodland would once have been the main vegetation. Other than individual specimens, trees and woodland were always intended to be part of a regime of felling and replanting. Sessile and pedunculate oak grew throughout Howth demesne. In 1786 Thomas Milton wrote described Howth as probably the Mona of Ireland ; *'...and tho' now denuded of Trees, was formerly covered with venerable Oaks' '* (The Seats and Demesnes of the nobility and gentry of Ireland') Much of the remaining woodland is now suffering from lack of maintenance.
Trees are long lived and only found on relatively fertile soils at least a foot deep. Similarly to most woods all over Ireland, the woods of Howth are virtually man made.
A large copse of trees, that is evident on all of the early maps, remains to the rear of Howth Castle. This is intersected by a number of walks.

James Joyce in "Ulysses" chose Howth as the place where Molly first said "Yes" to Poldy, lying amid the rhododendrons.

At Howth the tree planting was dense, a harsh maritime environment requiring thick planting. Aerodynamics have shown that a wall or thin line of trees merely makes with wind accelerate and flow even faster down the other side. The defence to salt laden wind was wide belts of trees that filter wind as if through a a lattice. Trees have survived to the rear of the house although the intersecting routes of the goose foot planting and French classical gardening are no more.

Sycamore widely introduced in the 15th and 16th centuries proliferate being one of the least sea spray sensitive trees.

Sub tropical garden

As early as 1790 Rhododendrom ponticum was introduced at Howth and initially retained as a wind break. Celebrated still today, for its rhododendrons and flowering shrubs, the sub tropical garden is located to the south of the castle nestling at the foot of Muck Rock. The first major plantings were carried out c 1850 and added to every year until 1909 the year of the incumbent Earl's death. In the 1920s there were already about 1000 rhododendron and azalea, half species and half cultivars. A wonderful variety of sub tropical plants can be seen.

The sheltered northern slope simulates the conditions in China and the Himalayas where these flowers thrive. Today Mare's Tail, an invasive, deep rooted weed, can be seen amongst the foliage and this will cause devastation and loss to the planting.



The Family Elm tree

The Family elm planted in 1585 was the oldest imported tree in Ireland. A prediction was made that when the last branch fell the title would become extinct. Despite extensive propping to postpone this event the tree succumbed and in 1909 the ancient title died out with the estate devolved to a nephew of the fourth and last Earl. This is the connection that resulted with the Raisford name incorporated with St Lawrence.

The Family Tree, an elm, – commemorated by this stone walled bed in its original position and indicated in the Birds eye view in front of the castle.

Deer Park

Deer Parks had gone into decline before 1600 but with the Restoration they reappeared. The demesne at Howth originally encompassed six hundred acres and included a Deer Park that required strong boundaries to ensure the herd could not escape. Parks were enclosed by 'pales, walls or hedges', the most expensive element of the park's construction. As deer are strong and capable of jumping great heights the enclosure needed to be high and strong. Usually ditches, palisade fencing or limestone walls were used to prevent them escaping or entering the pleasure grounds. Within the park animals were encouraged to breed and managed sustainably .

The park at Howth Castle had *'great store of conies, and very good fowling'* 1699 James Verdon.

Wild garden

The site had the perfect conditions for planting a wild garden – The micaceous granite hill faced north, had a steep slope, with deep peaty soil and sheltered from the sea. There is misty air and few frosts. The light The garden was planted in the nineteenth century with the rich, turf soil was brought up to the cliffs and thrown into the gaps between rocks. The rhododendrons produced a rich mulch to feed the plants. Around two thousand plant species were planted on the site, including exotic specimens like palm trees and tree ferns.

HG Wells described the garden as

> *'green and quiet, restful and fragrant, without any glaring colour, the Rhododendrons being up the hill side half-a-mile away, and there the gorgeous blaze of sunlit colour is tones and softened by greens and browns and greys innumerable, and overhead the everchanging sky.*

Yeats who lived in Howth in his youth, composed his first plays and poems wandering the hills paths and described sleeping out amongst the rocks and rhododendrons of the castle.

The common pink rhododendron was originally an introduced alien from Turkey and is used throughout Irish estates to simplify woodland management and provide cover for game birds. The more interesting Asiatic and American rhododendrons have suffered from the weed like characteristics of the common pink variety.
In the shallower soils on the rocks saplings of silver birch, mountain ash and willow are struggling to grow. Beech and Scots pine have been planted but although the pine suits the character of the landscape, the acid soil and exposure does not suit the beech.

Race course

The third Earl of Howth started horse races within the demesne in 1829/30.
He sited his race track in the Deer Park, closely following its boundaries, close to the main entrance gates. Within the race course a tree lined stream crossed the field towards the sea. The nearby Corr Castle was used as a grandstand for viewing the races. It can be seen on the Cassini map, located beside a quarry. Trees lined the northern demesne wall. Along the westerly one a deer house was located, by early twentieth century it was in ruins. A shelter belt is shown between the race course and the main avenue and to the north of the woodland surrounding the chapel. A detail of the 1745 bird's eye view shows the enclosed land to the east of the farmyard buildings, the tree lined space along the sea shore with Corr Castle in the background and the chapel appearing in good condition. There is no longer any physical evidence of the race course.

The course was known as *Howth Park Racecourse* and ran from the backgate lodge of the castle on Carrickbrack Road down to the corner of the grounds of Seafield House (Santa Sabina school since 1912) and North broadly along the route of Offington before circling Corr Castle and returning up along the Howth Road. The races were attended by all the leading owners, trainers and jockeys of the day with the race-card paying testament to the importance of the occasion. A sample of attendees from 1838 included Lord Howth, Lord Sligo, Sir John Kennedy, Captain Burke and Burnell and the Lord Lieutenant of Ireland. Although initially only members of respected racing clubs (Howth Park Club or the Corinthians Club at the Curragh and gentry were allowed to enter, in 1834 access was expanded to include a Trademen's Cup and in 1839 a Citizens' Plate. The races stopped permanently at Howth in 1842, likely due to the death of Emily, first wife of the Lord Howth however racing did eventually recommence post the great famine. Notable races included the St Lawrence Stakes and the Vaughan Goblet.

Ruins

The original family chapel has become a ruin. The late mediaeval building is overgrown and hidden within a wooded area beside the north wing of the castle. It was built in an east to west direction c1700 by Thomas, 26th Lord of Howth. The chapel can be seen in the 1745 birds eye view painting and on Bernard Scale's Map of 1773 to the north of the castle, surrounded by trees. Little is left apart from the outer walls with gothic pointed arch openings for the door and windows.

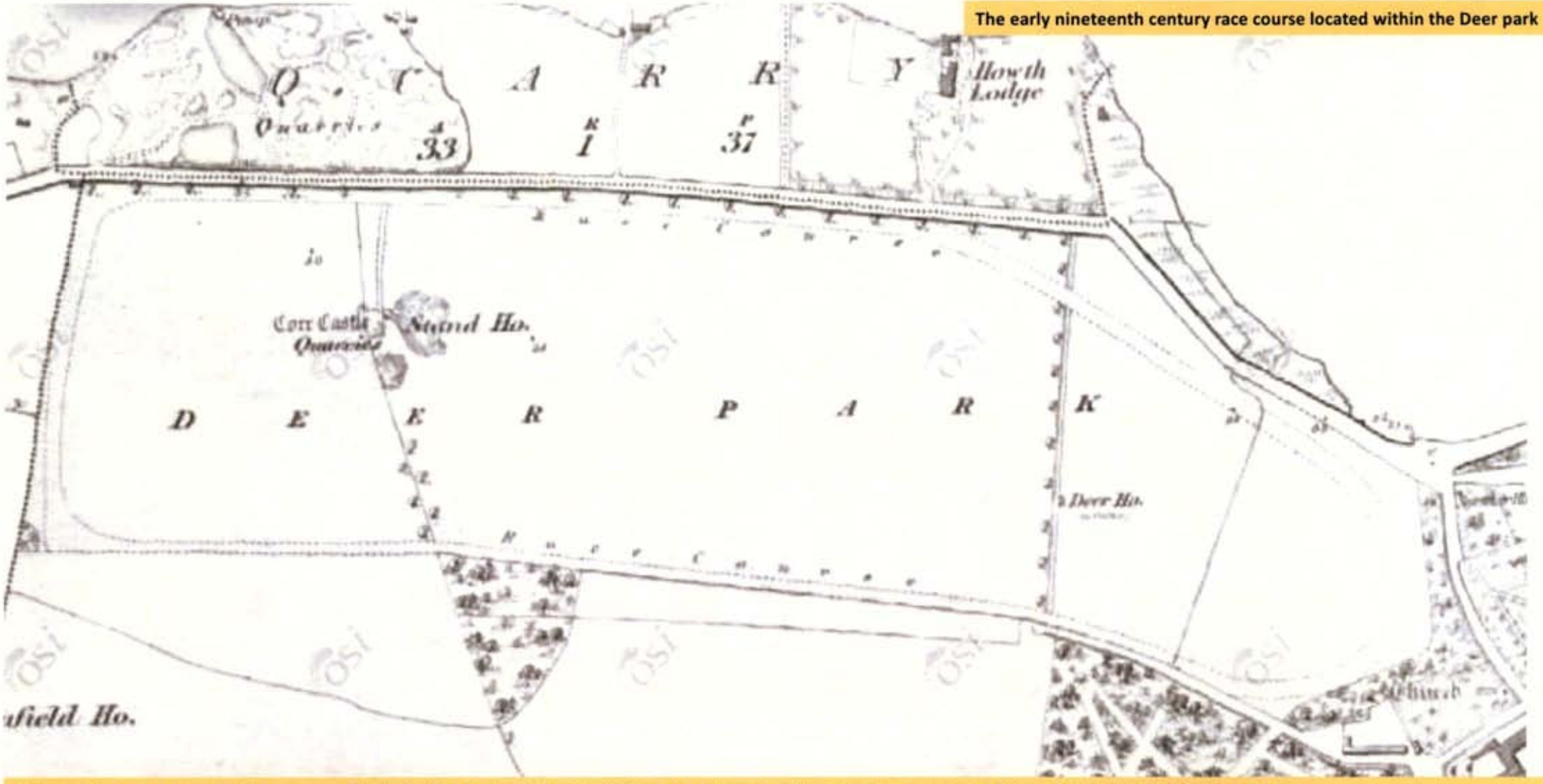
Dovecote

Ice house

The round tower/dovecote are not designed ruins but are now in a ruinous state. The ice house was a utility building common to all country houses which provided ice for preserving food and preparing iced food. The design was usually three quarters underground with soil covering on top providing an impenetrable layer.

Left : ruins of the chapel
Centre: the Ice House
Right: Detail from bird's eye view of the demesne with the chapel indicated adjacent to the deer park.

The early nineteenth century race course located within the Deer park



Ordnance Survey map showing the race course located within the Deer Park. Corr Castle was used as a grandstand and two quarries are shown, either side of the demesne wall.
The site of the proposed development is located within the eastern sweep of the race track.
The course was known as *Howth Park Racecourse* and ran from the backgate lodge of the castle on Carricbrack Road down to the corner of the grounds of Seafield House (now Santa Sabina school) and North broadly along the route of Offington before circling Corr Castle and returning up along the Howth Road.

Water features

The historic maps indicate the many streams that poured down from the rocks above the castle. The banks of a meandering stream are shown on Rocques map flowing directly in front of the castle. The moat in front of Black Jack's Well was an artificial pool that was formed in the early eighteenth century by banking up the stream. The swan pond was fed from the 'Bloody Stream'. The canal which has swans floating on it in the wall painting is still in existence without the statues and urns. In the seventeenth century connecting a garden with a natural water feature was characteristic of Anglo Dutch garden design.

Ornamental canals and ponds stored carp, trout and roach to feed the castle. A second swan pond was located beside Lady Sidney's garden.

The Bloody Stream ran in front of the castle, another stream used to pass directly by, and was later captured by castle drainage, and a third was connected to the Swan Pond. One of the streams in Sutton also comes from within the estate.

Muck Rock

To reach the summit of Muck Rock paths are cut through walks in the rhododendron past the Cromlech. From the summit there is panorama from the Mourne Mountains to the Wicklow Mountains.
H.G. Wells described the experience visiting Muck Rock as *'...between high hedges of clipped beech, and up a steep winding path amidst great bushes of rhododendron in full flower to the grey rock and heather of the crest. They stood in one of the most beautiful views in the world. Northwards they looked over Ireland's Eye and Lambay and the blue Mourne Mountains far away; eastwards was the lush green of Meath, southward was the long reach of the bay sweeping round by Dublin to Dalkey, backed by more blue mountains that ran out eastwards to the Sugarloaf. Below their feet the pale castle clustered amidst its rich greenery and to the east the level blue sea sustained one sunlit sail.'*

Cromlech

Near the castle, the residence of the Earl of Howth, is a pagan alter or cromlech, which is well worth the visiter's attention as are the remains of an ancient abbey and college founded in 1228. (Slater's Commercial Directory of Ireland for the year 1846, publ Manchester and Dublin)

In the dip to the east of the demesne is the giant's grave or Cromlech. Legend says it marks grave of Aideen who died of grief at the death of her husband Oscar, a Fenian. It consists of a large irregular piece of quartz eighteen feet by twelve supported on seven foot high stones (now collapsed) Attributed to the period 2500 BC when intricate burial tombs were devised and cromlechs are believed to be the remains of sepulchral monuments raised in honour of departed kings or chieftains to protect the contents of their tombs. It is located within the Rhododendron Gardens. Estimated to weigh 90 tons the capstone, 17ft long by 12 ft wide, has slipped of its eight supporting stones. In c1760 Beranger wrote 'It was thrown down by some violent shock'.

Quarry

The historic maps indicate various quarries located within the grounds of Howth castle including within the Deer Park.
The Earl of Howth supplied over 91,000 tonnes of local quartzite and schist from his quarry at Kilrock above the Balscadden Road for the construction of the harbour. This arrangement ended acrimoniously. The granite ffacing stone for the piers was brought over by boat from Dalkey and sandstone came from Runcorn, near Liverpool.

Character of the demesne

The character of the demesne is Romantic and Picturesque. Steep rocks, streams, ivy covered ruins, hanging woods and pagan cromlechs all conveyed the sublimity of the picturesque.

2.5 Demesne wall

A boundary wall defines the extent and grandeur of an estate with a public announcement to the outside world.
Beside the main entrance the demesne wall originally followed the seashore but since then it has been infilled with the railway tracks into Howth.
The demesne wall which enclosed the deerpark followed the land boundary of castle and what is now the Howth Road between Sutton Cross and the town and enclosed Corr Castle. Along the road very little remains of the original wall on this stretch of the road due to the development of houses.
There were ample supplies of very good stone in several quarries in and near the park. One quarry is shown on the OS map within the Deer Park and another just outside the demesne wall. The stone, referred to as calp, was a muddy limestone underlying the Dublin area, and ideal for building walls. It had a number of major advantages, having been formed in shallow beds of about three to twelve inches in thickness. It was removed from quarries in orthogonal blocks and it broke easily into walling stones with the mason's hammer

The protected structure that will be physically and visually affected by the development proposals is the demesne wall bounding the site to the north.
The site is approached from Dublin along the coast road where a limestone wall forms the site boundary. The wall will be retained and integrated within the proposed development. It will be impacted upon as access provided to the proposed development through openings within the wall.
The demesne wall that surrounded Howth Castle was constructed in a simple random rubble construction using locally available limestone. The section that bounds the site on the Howth Road was a boundary wall to the Deer Park. A considerable height would have been required in order to stop the deer from escaping. It later enclosed the race course.

Subsequent rebuilding and repairs can be identified where different mortars were used but this type of wall construction changed little over centuries. The texture of the rock is moderately coarse. The castle quarry produced the clay limestone used in the construction. The mortar used in the original sections has a coarse aggregate. Remains of lime render can be seen along the wall.

Parts of the wall are covered with ivy and until it has been fully removed the condition of the underlying structure cannot be fully assessed. Ivy roots have embedded within joints and these require careful removal so as to do no further damage. Natural erosion of mortar can be seen between some stones and generally the wall appears in sound condition. The use of limestone required a thick wall for structural stability. The mortar varies between soft lime mortar and a modern dense cement based mix. At the location of the proposed residential development the wall height varies, this overall height increased by the supporting bank. The construction is simple and no architect is identified with the work.

Entrance gates and lodges

Since fortified walls were built, whether for towns or castles, defensive gateways were required in order to get into them. Despite the indulgent architectural fantasies extended to the building type gates and gate lodges were not merely garden ornament but extremely functional buildings, often housing gate keepers and their family. Security was perceived as an issue in early nineteenth century Ireland and the resident occupant was responsible for keeping the gates shut and controlling access.

A foretaste of the architectural qualities within a demesne is often provided by the gate lodges, arranged formally beside, or even as a feature of, grand entrances. Often mirroring the architecture of the house, these range from modest estate workers' houses to miniature classical temples and monumental gate houses . At the entrance to the demesne they could project the image and value of the owner, a first impression of what was to follow. The prime importance of the siting for picturesque and scenic effect. Gates and their lodges gradually moved from the castle to the park entrance.

Unusually Howth Castle remained without lodges until the mid nineteenth century and then they were built merely as decorative and convenient structures. There were originally five gateways into the demesne. At the front gates the model was the independent but inhabited lodge, the gateway creating the impression with the lodge providing more comfortable accommodation.

The main entrance gate from within the demesne

The main entrance gates to Howth Demesne

The third earl was a passionate horseman. From the winnings of his top racehorse Peep O'Day Boy he built the main entrance gates and lodge. The architect of the gates at Howth in 1840 was Richard Morrison who was carrying out alterations to the castle and stables. An almost identical screen by Morrison is seen at Lismore Cathedral and another example at Portumna Castle. The 3rd Earl, Thomas St Lawrence, had married Lady Emily de Burgh daughter of the earl of Clanricarde from Portumna 1826.

The influence of Batty Langley's 1747 *Gothic Architecture, improved by rules and proportions* is seen in the design. It consists of a four pillared Gothic screen constructed with ashlar limestone and containing arched postilion gates. The octofoil cluster columns support concave cappings decorated with foliated friezes and originally crowned with floral finials. The central columns act as gate piers to the main entrance gates with cast iron gates, while the pedestrian gates are housed within the arches. Only ruins remain of the gate lodge which was a Tudor Revival cottage with a steeply pitched roof featuring diagonally set stone chimney stack, saw tooth slating, hip knobs and fretted barge boards. A gabled breakfront front with gabled porch sheltered the front door.

Left and right :
The ruined gate lodge at the east entrance.

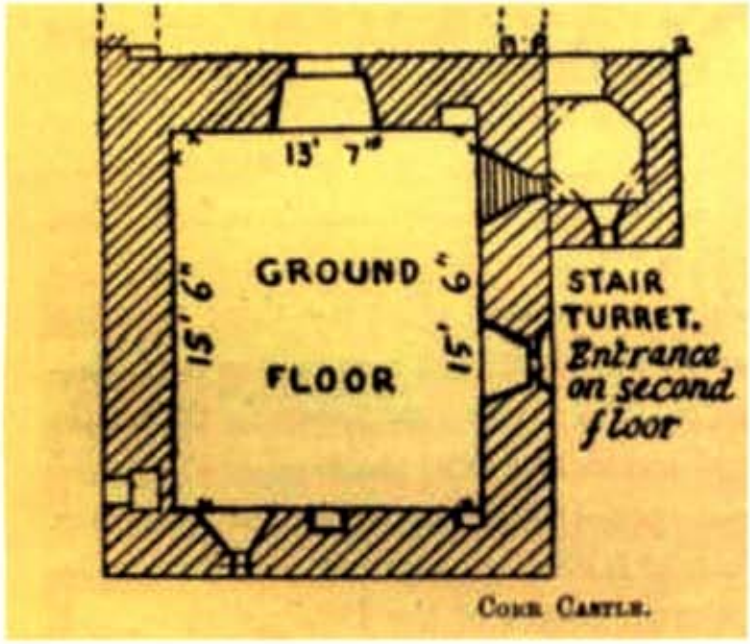
The main entrance gates to Howth Demesne

Lodges situated at secondary entrances would have houses valued servants or stewards.

At the south entrance the gate lodge built in 1837 has been demolished. All that remains on Carrickbrack Road is a mid Georgian gate screen of V-jointed rusticated pillars with ball finials and festoon friezes.

At the East entrance to the demesne a gate lodge was built by the architect Joseph Maguire in 1872. An article in the Irish Builder informed the reader *'.. A neat lodge has been completed near the deer park, Howth Castle, the seat of the Rt Hon, the Earl of Howth, Mr Joseph Maguire, architect.'* The building was a single storey cottage with a hip roof covered with scalloped slates. Subsequent additions of a flat roofed extension to the front and two storey to the rear shown on the 1907-8 OS map as a lodge have obscured the original building.

2.6 Corr Castle



Part of the original demesne, Corr Castle (Cáisleán an Chórraig, the castle of the Marsh) is a gate lodge dating from the 15th century, probably only an outpost of Howth Castle, built on higher ground in order to guard the isthmus at Sutton. Belonging to the White family, it passed into the 'Blind Lord' of St Lawrence family of Howth Castle in the mid 16th century. It consists of *'an oblong tower, four stories high, nineteen and a half by twenty two feet outside, and thirteen and a half by fifteen and a half feet inside. The third story has a stone floor which rests on a vault still bearing the mark of wicker centring over which it was built. For some reason the which is not apparent, this vaut covers only part of the space, leaving an opening the whole length of the south wall. Indeed, defence does not seem to have been considered by the builders; no murder-hole or loops command the door, nor are there any machiolations although a corbel for a chimney to the east might easily be mistaken for one.....*
The stairs are of far better execution than are usually seen in the peel and church towers of the `Dublin district and though, without a newel, the steps are neat and well set. They number forty in all, and lead to the battlements which command a fine view of the sea, similar to the one from the chief tower of Howth Castle and also of the southern side of the peninsula.' Elrington Ball

It was used as a grandstand for the Howth races set up by the 30th Lord of Howth. The circuit ran from the avenue of Howth Castle to just beyond Corr Castle

The area around Corr castle has since been developed as a housing estate and the modest tower house surrounded with blocks of flats constructed in 2000 and set on c.7 acres of private landscaped grounds with the old castle ruins as its centrepiece.

Today the structure lies within a private, gated residential estate and access is restricted.

Present context of Corr Castle

3.0 CONTEXT

3.1. 20th century context

Most of the demesne lands of Howth Castle have been converted for use as a golf course since the early 1970's and so the field system and pastoral setting no longer exist but some of the designed landscape features have survived as discussed in this report. In the early 1970's the Deerpark Hotel was constructed. In mitigation, the general public is allowed access to much of the grounds of Howth Castle either though use of the golf course or hotel facilities and it is possible to walk through the spectacular Rhododendron Gardens onto the Hill of Howth. To a certain extent the immediate setting of the castle is protected by gardens and trees. Parts of the formal gardens have survived along with the ancillary buildings.

Golf courses have been the fate of many of the great houses of Ireland, to greater and lesser success. Carton, Powerscourt and Adare Manor that spring to mind and are prime examples, with bunkers located directly adjacent to the main entrance fronts of great houses. To paraphase Gertrude Stein - A golf course is a golf course is a golf course. The golf course design may try to masquerade as parkland but its character is unmistakable with its manicured tees, sand bunkers and putting greens a far cry from the Duchess of Leinster's spotted cows munching in the parkland at Carton.

The site is also located in proximity to significant protected structures, in particular the main entrance gates, the castle and its ancillary buildings. The nineteenth century St Mary's Church is located nearby to the east on higher ground.

To the west of the site the Howth Road is lined with houses of 20th century design.
The recently permitted development at the Techcrete site will provide a dense residential development, a gateway into Howth village and have the most significant impact on the surrounding context.

3.2 Protected structures

There are a number of protected structures identified within the Record of Protected Structures that are not physically affected by the development proposals but that that may be visually impacted.

Howth Castle
Surrounded by gardens and tree planting the castle is not visible from the site. Its views are not impacted by the proposed development.

Main entrance gateway
Designed by Morrison the main entrance gateway signals the entrance to the castle and is a fine structure. It is close to the site and there will be a significant impact on its setting.

St Mary's Church
Present church on the site consecrated in 1866. Designed by J.E.Rogers in thirteenth century style with tower in north west angle with 80ft spire terminating in a finial. 'The established church is a neat building, situated on an eminence at the entrance of the town, with a tower and pinnacles;' *Slater's Commercial Directory of Ireland for the year 1846, publ Manchester and Dublin*
It features a pointed entrance door with deeply recessed jambs and carved capitals and arch mouldings. Caen stone pulpit and Evie Hone window. The iron entrance gates to the church site are supported by square stone piers with triangular capping stones, set in a random rubble boundary wall. Within the grounds of the church is a new parish centre, built in the early 1990's. The building is located in a prominent position on raised ground. Views of the church will be impacted by the development however views from the church and the area in front of the building will be screened by the existing thick planting.

Corr Castle
At some distance and now separated by housing developments from the demesne, Corr Castle has been described elsewhere within this report and will not be impacted by the proposed development.

Seafield House
On the south side of the Howth peninsula is a handsome five bay Georgian house built Richard Coburn Carr, in 1790. It features a Wyatt window over wide doorcase with fan light and side lights. It reverted to the 4th Earl and was subsequently sold to an order of nuns who established a school there. This house is located at a long distance from the development and there will be no visual impact.

3.3 Demesne wall assessment

The section of demesne wall that bounds the side of Howth Road is all that remains of the landlord's boundary that originally ran almost to Sutton Cross. It is located beside the main entrance to the castle but separated from the buildings with a golf course taking up the intervening grounds. Its condition appears structurally good, however requires its appropriate assessment by a structural engineer. The upper courses consisting of about fifty percent of the wall have been rebuilt and the original wall repointed to a considerable extent. The newer portion of the wall is quite clearly seen although original stones have been used in the construction. In parts ivy growth obscures the wall and is likely to cause damage if left in situ.

The wall possesses heritage value and is intrinsically linked to the castle. It has architectural and historical interest and contributes positively to the heritage of the county.
As the protected structure is physically impacted by the proposed development the demesne wall has been assessed for cultural interest. This report considers whether the building fabric of the demesne wall can be considered to have sufficient heritage interest to warrant retention, and to what degree, as part of the proposed development on the site. An assessment of relative significance is, inevitably, a comparative process, and for this reason it relies heavily on the analysis of a range of information. It aims to establish whether a building, or a component of it possesses sufficient special interest to be of local, regional, national or international significance. The demesne wall is an intrinsic part of the Howth Castle demesne.

The Planning and Development Act 2000 requires that a building be of special interest under one or more designated categories in order to merit protection. The Act stipulates the following categories to use in order to determine whether it possesses special interest or importance. These categories are: architectural, historical, archaeological, artistic, cultural, scientific, technical or social.

Testing against these criteria identifies the special interest that may be attributed to the protected structures on site

Architectural
Demesne wall construction between 18th and 20th centuries.
Historical interest
Demesne wall was a symbol of the Big House
Archaeological interest
None identified.
Artistic interest
Not identified
Cultural interest
Not identified
Scientific interest
Not identified
Technical interest
None identified.
Social interest
No known social interest

Rating : Regional

3.4 Statement of significance

Demesne walls were an intrinsic element of the great estate in Ireland, they announced and defined the importance of the landholding. The scale and confidence of their construction was a tribute to the ownership of landscape. The demesne was the public expression of the economic and social power of the landowning class. *'It is not just the structures that contribute to the character of the ACA but the designed landscape features are integral to the appeal and attraction of this area. ' (ACA)*

APPENDIX 16.2
PHOTOGRAPHIC RECORD OF THE DEMESNE WALL

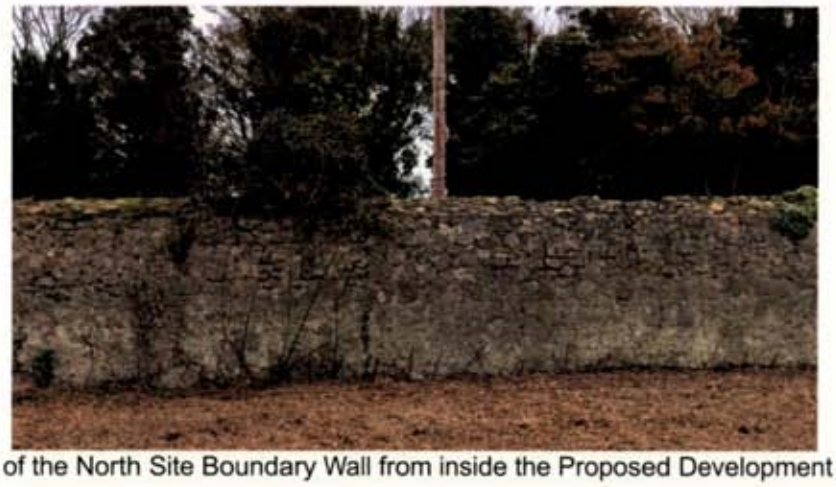
VOLUME III
APPENDICES TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAY 2024

Appendix 16.2

Photographic Record of the Demesne Wall taken by FLYNN Architects in 2023

View of the North Site Boundary Wall from inside the Proposed Development Site
The following photographs provide a continuous elevation of the inside face of the historic wall



View of the North Site Boundary Wall from inside the Proposed Development Site

View of the North Site Boundary Wall from inside the Proposed Development Site showing where the wall has been over-grown and is partially collapsed

View of the North Site Boundary Wall from inside the Proposed Development Site showing where the wall has been over-grown

View of the North Site Boundary Wall from inside the Proposed Development Site showing where the wall has been over-grown and is partially collapsed

View of the North Site Boundary Wall from inside the Proposed Development Site showing where the wall has been over-grown and is partially collapsed

View of the North Site Boundary Wall from inside the Proposed Development Site showing where the wall has been over-grown and is partially collapsed

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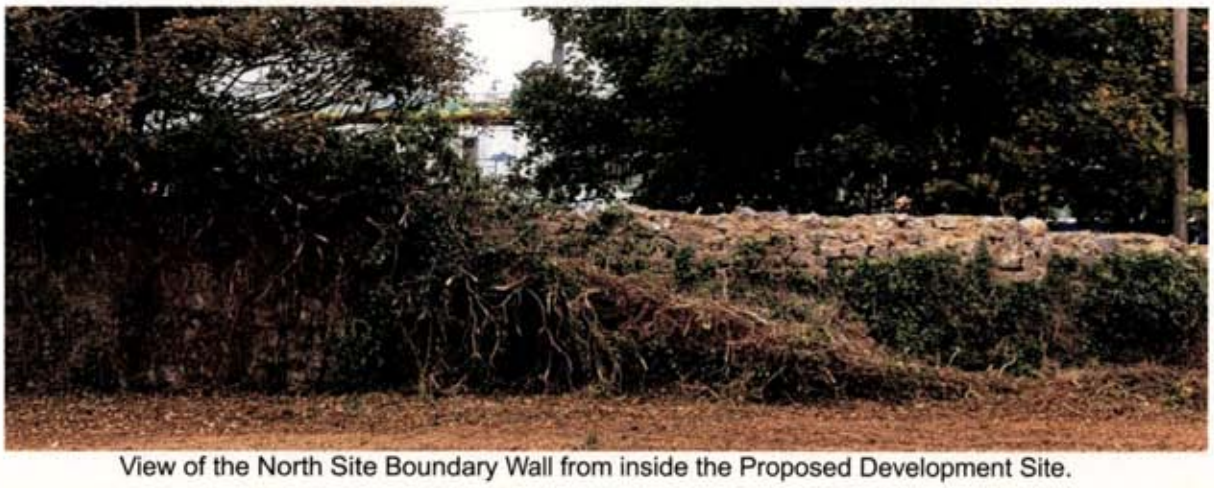
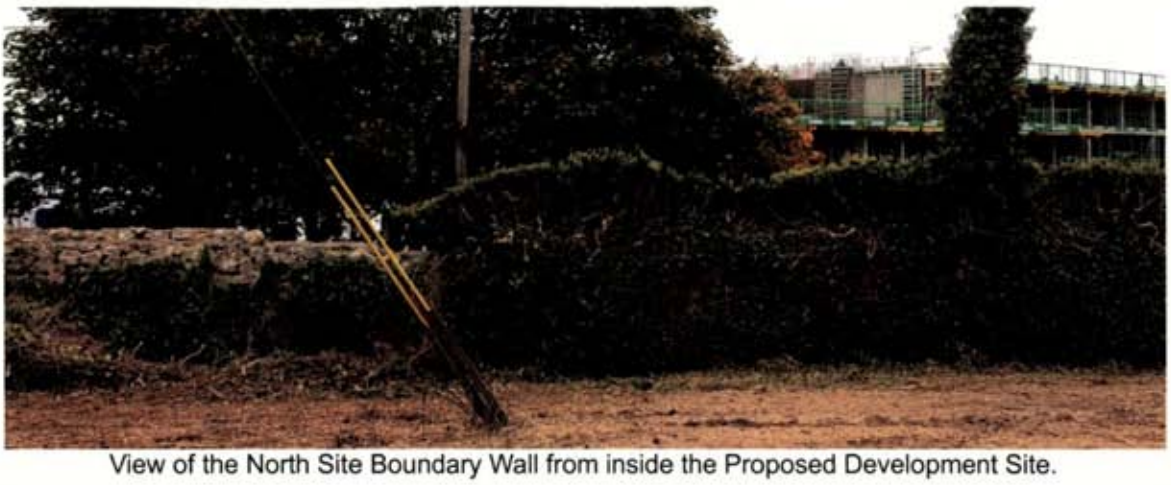
View of the North Site Boundary Wall from inside the Proposed Development Site.



View of the North Site Boundary Wall from inside the Proposed Development Site.



View of the North Site Boundary Wall from inside the Proposed Development Site.

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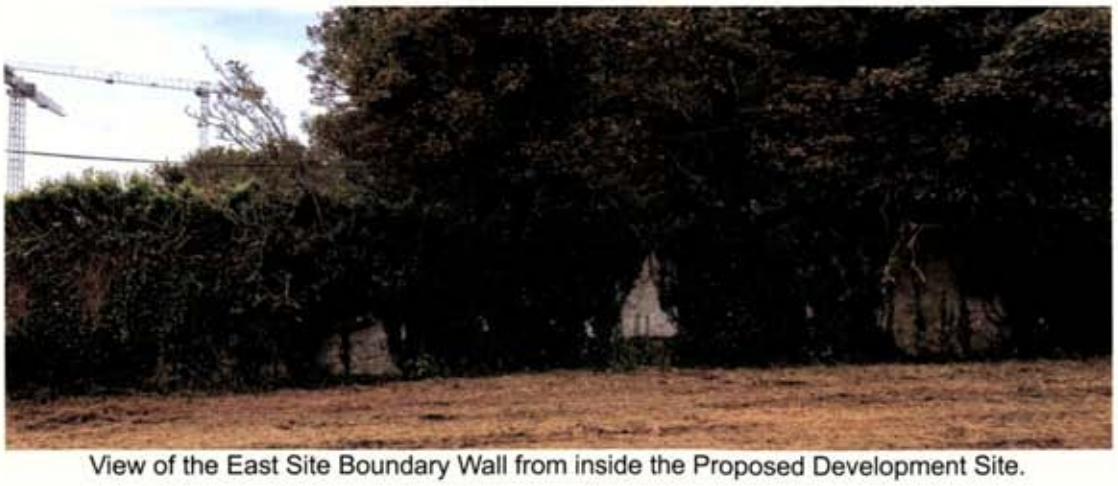


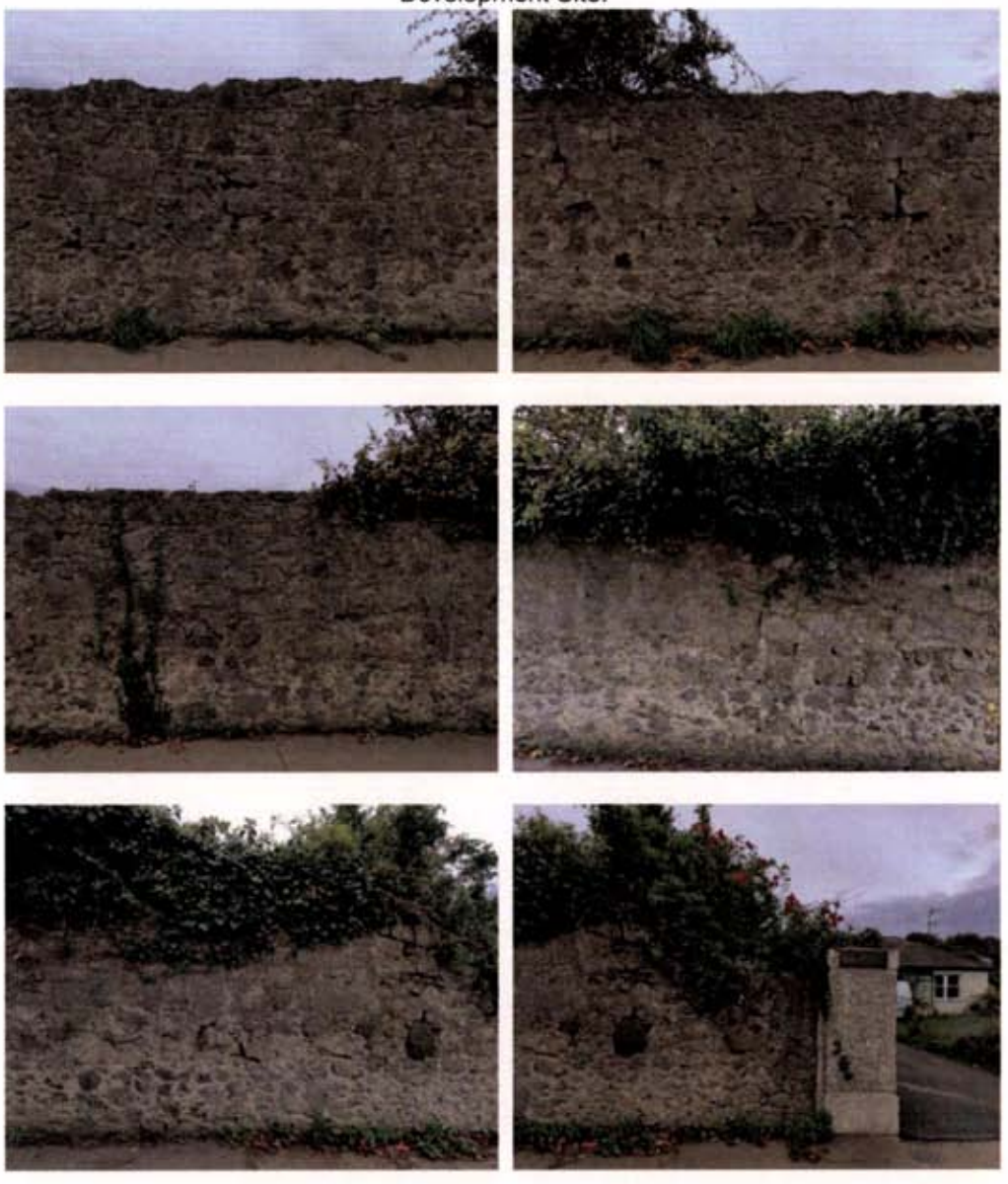
View of the East Site Boundary Wall from inside the Proposed Development Site.

View of the East Site Boundary Wall from inside the Proposed Development Site.

Below: Elevation View of the North Site Boundary Wall from Howth Road / outside the Proposed Development Site.

Below: Elevation View of the North Site Boundary Wall from Howth Road / outside the Proposed Development Site.

Below: Elevation View of the North Site Boundary Wall from Howth Road / outside the Proposed Development Site.



Below Left: View along the former demesne boundary wall towards Howth Village
Below Right: View along the former demesne boundary wall away from Howth Village

APPENDIX 16.3

METHOD STATEMENT FOR REPAIR OF THE DEMESNE WALL

VOLUME III

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Appendix 16.3

Method Statement for alteration and repair of the boundary wall

It is proposed to take down three sections of the demesne boundary wall to provide new entrances to the proposed development. The remaining sections of the wall will be cleared of plant growth, repaired as required and re-pointed where necessary. Graffiti will be removed.

The existing boundary wall is built of coursed random rubble which is mainly calp limestone. Sections have been rebuilt and repointed in cement based mortars, though the historic construction is generally limestone pointed with a non-hydraulic lime mortar. Evidence of historic alteration and rebuilding can be seen by the variation in stone and workmanship. The wall is partly overgrown and supported on a grassed bank where its foundations are not known.

Refer to Appendix 16.2 for current and historic photographic records and descriptions of the wall.

GENERAL METHODOLOGY

The proposed alteration and repair of the historic boundary wall is to be carried out in accordance with the principles of the Venice and Burra Charters produced by ICOMOS Australia in 1979 and amended in 1981, 1988 and 1999. These documents define current conservation practice and terminology and make sensible recommendations for its practice. They include definitions of principles, processes, preservation, restoration, reconstruction, adaptation and practice, all of which are to be followed in the restoration of the north lodge.

The works must further adhere with the guidance in the Architectural Heritage Protection, Guidelines for Planning Authorities (2011) and the Department's advice series publications.

GENERAL PRINCIPLES:

The work is to be based on an understanding of the wall and its development. The highest conservation standards will apply to the contract. The aim is to recover and retain the significance of the feature while allowing alterations that provide a use to ensure its survival. All features and materials of importance to maintain the structure's character and special interest will be retained including fabric of all ages.

The objective of conservation work is to stabilise the wall and slow down deterioration. The wall should not look very different after conservation works except that the fabric is more stable and secure. All effort is to be taken to ensure that necessary new work on the looks appropriate and is in keeping with the fabric, materials and style of the original work. However, it should be possible to 'read' changes to the wall, both modern and historic, through close inspection. No important architectural features, later changes, or other features should be masked, including original mortar, where this is sound.

All intervention will be restricted to the minimum that is consistent with the established philosophy and the appropriate use, reuse, and continued survival of the wall. The philosophy of doing 'as little as possible and as much as necessary' applies.

Salvaged materials from the proposed taking down and opening up of the wall will be reused in the repair works. Unless salvaged slates are in very good condition they may not be used.

GENERAL DIRECTION

The wall is historic, set in a sensitive historic landscape, and care must be taken at all times to protect any items and any parts of the fabric and the associated landscape that could be damaged due to the works.

The contractor will be required to carry-out an inspection of the wall including a condition and structural inspection, with the conservation architect prior to the commencement of the works and to prepare a pre-works inspection report of the visit including specialist inspection reports and a contractor's photographic condition survey. The contractor is to facilitate access for the conservation architect to inspect the works and any fabric which has been removed from the wall which is stored on or off site.

Detailed daily records including photographs are to be kept of the works at all stages and Fingal County Council's Conservation Officer will be kept informed of progress on-site with regular reports.

INSPECTION AND RECORDING

The boundary wall shall be recorded with a full Measured and updated photographic survey. Dimensional information will include length to be removed, height, relative levels, stone material and coursing. Record documents of the wall must be delivered to the conservation architect and approved in writing before any removal takes place.

Before dismantling, the stones shall be numbered and the section of wall recorded photographically. The numbering of stones shall be carried out using a water-soluble paint that can be washed off later without damage to the surface of the stone. Each unit shall be marked clearly, indicating its original position in the construction. The markings shall be transcribed on to drawings/ photographs. A full scale drawing of the stonework in place is to be made on a transparent plastic sheet prior to dismantling.

MONITORING

The works to the wall will be carried out under the professional supervision of a conservation engineer in accordance with the Department of the Arts, Heritage & Gaeltacht Guidelines and Advices to ensure

that all works are carried out in accordance with best conservation practice. All monitoring arrangements to be agreed at the outset of the works.
Before any work commences the Contractor must carried out a detailed inspection of every element and confirm that the Method Statement is appropriate to the works. Where necessary, where required by the dismantlement, the Method Statement must be adjusted to take account of new information. Where this occurs, the revised statement must be submitted to the conservation architect for approval prior to the continuation of the works
Appropriate inspections and guidance to be provided during the implementation of the works by a RIAI Grade 1 conservation architect. The Architectural Conservation Officer of Fingal County Council is to be consulted at all stages of work. Expert conservation advice shall be incorporated within detailed specifications and safety documentation.

SCAFFOLDING AND SITE HOARDING
All scaffolding and hoarding to be used must be of a free-standing, self-supporting nature, i.e. 'retention scaffolding'. Scaffolding and hoarding should be erected in a manner which is not reliant on a historic structure for stability. The scaffolding or hoarding must not touch, lean on, or use the historic structure for support (or leverage) at any time without approval. No compression ties or reveal ties are permitted without prior approval.

PROTECTION OF THE HISTORIC FABRIC
The contractor is required:
to take all necessary precautions to ensure no damage occurs to the building fabric.
to provide such protection as is necessary to prevent the ingress of rainwater and or ground/surface water to the building or staining, splashing etc;
to confirm items and elements that are to be protected in position before commencement of work. These include historic windows and window surrounds, historic doors and door surrounds and historic skirting boards, dado and picture rails etc. Protection of these items is to be in place to the satisfaction of the conservation architect prior to the commencement of works. Protection measures may include the provision of hard board, softwood or other support protections, wrapping with bubble wrap etc.
to properly blank off or seal services such as drains, water supply etc. to prevent damage directly or indirectly to the building fabric;

DEMOLITIONS AND REMOVALS
The contractor will be required to agree all fabric to be removed with the conservation architect, prior to commencement of demolitions.
The contractor will be required to prepare and agree a methodology detailing the recording, labelling, removal and storage of the identified fabric which is to be set-aside for re-use.
Stone salvaged from the boundary wall is to be labelled, removed carefully and stored in a secure location on site. This reduces the handling of the historic material and thereby lessens the risk of loss, damage or breakage. The stone is to be laid on pallets and evenly supported to prevent breakage.
Power tools for the removal of stone and mortar are not to be permitted. On dismantling the stones shall be cleaned of old mortar, organic growths and soiling.
The storage facility shall provide clean, dry conditions, free of contamination. The stones shall be stored on level bearers clear of the ground and separated with resilient spacers.

RE-USE OF HISTORIC MASONRY
It is intended to re-use the dismantled stones for the repair of the retained sections of wall and within the landscaping scheme of the proposed development. Any insertions will be carried out using lime mortar and traditional stone masonry techniques.

MASONRY REPAIRS
Masonry repairs are to be carried out by an experienced specialist approved by the conservation architect. Historic masonry specialists should be experienced in this type of work and should be able to show that they have undertaken work of this nature before.

PLASTER AND MORTAR ANALYSIS
The contractor is to provide for existing render, plaster, mortar and/or stone samples to be taken and analysed by a mortar and stone specialist who will advise on both mortar and stonework. The analysts report will be used to inform the specification for the replacement mortars, renders and plasters.

SERVICES, WEED GROWTH:
Refer to the Ecologists requirements for the removal of plant growth and works to historic walls. All plant and weed growth, and defunct services are to be removed.
All ivy is to be cut back and undergrowth to be cleared by hand, using scythes, slash-hooks or strimmer prior to dismantling the wall. Nearby tree stumps to be treated with an appropriate systemic herbicide. Ivy to be removed from the wall face is to be treated with an approved herbicide at the stump or root and cut at it base prior to its removal from wall face. Loose stones uncovered by clearing vegetation shall not be moved until site recording of cleared area has been carried out. Any loose stones are to be tagged and stored in secure location on site. The extent of dismantling and reconstruction is to be confirmed by structural engineer.
Clear vegetation or organic material, spray diluted biocide as recommended by manufacturer in accordance with the ecologists recommendations. Products suitable for vegetation removal on and around masonry monuments contain the active ingredient glyphosate that requires appropriate Health and Safety precautions for public and operatives.

STONE CLEANING
It is not proposed to generally clean the rubble walling except locally to remove graffiti which will proceed on the basis of trials with methodologies to be agreed in advance by the conservation architect. Before and after photographs will be required for comparison. Trials will be assessed on their clean and fully dried appearance.
Stubborn dirt including algae, bitumen and modern paints and coatings may be removed using a proprietary steam system at 150 oC on the basis of cleaning trials and only as agreed with the conservation architect.
Mild detergents and other surfactants, with or without very dilute acids may be used on the basis of cleaning trials and only as agreed with the conservation architect. Where chemical washes are proposed and accepted, only solutions with concentrations of below 1% are to be used, with minimum periods of contact with the historic masonry. Stone surfaces must be pre-wetted and after the cleaning material has been on the face of the stone (for typically 2 to 5 minutes) it must be very thoroughly washed off. Pre- wetting and washing off should be carried out with a pressure not exceeding 2760 kPa (400-psi).
Poulticing may be required for treating specific types of heavy soiling or stains, especially complex forms such as oil, grease, or paint. Surfactants, or solvents, are placed against the face of the masonry by means of a proprietary poultice following the manufacturers' instructions.
Compressed air and abrasives are not to be used to clean the historic masonry

RAKING OUT
Raking out is to be carried out only where required and agreed with the Conservation Architect. It is to proceed on the basis of trials, where it can be demonstrated that the mortar can be removed without causing damage to the surrounding masonry. Mortar should be raked out using hand tools only.
Sample sections of raking out for the general walling, 1m x 1m square are to be prepared for the approval of the design team.
The use of mechanical tools in the hands of specialist conservators may be appropriate for the removal of later cement repointing but this must be agreed with the design team prior to their use on the walls.
Pinnings (spalls) dislodged in raking out should be retrieved and reused.

REPOINTING
The extent of repointing will be confirmed on-site with the masonry repair specialist.
Repointing is only to be carried out as necessary where the existing pointing has deteriorated and is causing damage to the stonework or other fabric. Sound old pointing should be left undisturbed, as it is an essential part of the fabric and character of the historic walls which should not be removed unnecessarily.

New pointing should be subservient to the stonework and ribbon, weatherstruck or strap-pointing will not be accepted. New pointing is to match the colour, profile and texture of the original joints including the grain size, colour and shape of aggregates. Sample sections of re-pointing 1m x 1m are to be prepared for the approval of the design team. Positions are to be agreed at discrete locations, taking in all relevant conditions, prior to the preparation of samples.

MORTAR

Mortar specification is to be informed by the specialist analysis and will be to replicate the historic: For pricing purposes, allow for hydraulic lime and aggregate. Maximum strength NHL 2.5 for general walling, NHL 3.5 for base course and coping. Aggregate to be of coarse composition, with gravel, brick, shell, and other additives.

REPLACEMENT STONE

In all cases, repairs should be carried out rather than replacing materials. Replacement stone is to match the existing material, colour, texture and surface finish, and should be available from demolition materials.