APPENDICES

APPENDIX 6.1: SITE INVESTIGATION REPORT

S.I. Ltd Contract No: 5877

Client:	Gannon Homes Ltd
Engineer:	Waterman Moylan
Contractor:	Site Investigations Ltd

Belcamp – Phase 2,
Balgriffin, Dublin 17
Site Investigation Report

Prepared by:

………………………………………………………
Stephen Letch

Issue Date:	20/10/2021
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Revision	1

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Appendices:

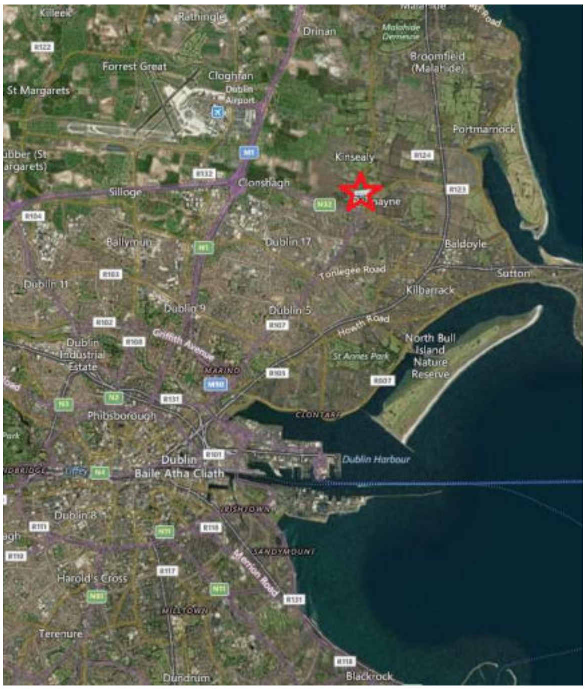
1. Introduction

On the instructions of Waterman Moylan, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Belcamp, Balgriffin, Dublin 17. The investigation was for a residential development on the site and was completed on behalf of the Client, Gannon Homes Ltd. This investigation was completed in October 2021.

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 is located to the west of the Malahide Road, Balgriffin, Dublin 17. The first map below shows the location of Balgriffin in north Dublin and the second map shows the location of the site in Balgriffin.



3. Fieldwork

The fieldworks comprised a programme of cable percussive boreholes, trial pits with dynamic probes, soakaway tests and California Bearing Ratio 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.

The fieldworks comprised of the following:

- 5 No. cable percussive boreholes
- 10 No. trial pits with dynamic probes
- 7 No. soakaway tests
- 8 No. California Bearing Ratio tests

3.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 5 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The boreholes terminated at depths ranging from 7.30mbgl (BH05) to 7.80mbgl (BH01). 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 1.00mbgl where N=13-(2,2/2,3,4,4)). 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 5.00mbgl where N=50-(8,11/50 for 210mm)).

The logs are presented in Appendix 1.

3.2. Trial Pits with Dynamic Probes

10 No. trial pits were excavated using a wheeled excavator. The pits were logged and photographed by SIL geotechnical engineer and representative disturbed bulk samples were recovered as the pits were excavated, which were returned to the laboratory for geotechnical testing.

Adjacent to the trial pits, dynamic probes were completed using a track mounted Competitor 130 machine. The testing complies with the requirements of BS1377: Part 9 (1990) and Eurocode 7: Part 3. The configuration utilised standard DPH (Heavy) probing method comprising a 50kg weight, 500mm drop height and a 50mm diameter (90°) cone. The number of blows required to drive the cone each 100mm increment into the sub soil is recorded in accordance with the standards. The dynamic probe provides no information regarding soil type or groundwater conditions.

The dynamic probe results can be used to analyse the strength of the soil strata encountered by the probe. 'Proceedings of the Trinity College Dublin Symposium of Field and Laboratory Testing of Soils for Foundations and Embankments' presents a paper by Foirbart that is most relevant to Irish soil conditions and within this paper the following equations were included:

Granular Soils: DPH N_{100} x 2.5 = SPT N value

Cohesive Soils: C_u = 15 x DPH N_{100} + 30 kN/m^2

These equations present a relationship between the probe N_{100} value and the SPT N value for granular soils and the undrained shear strength of cohesive soils.

The trial pit logs with the dynamic probe results are presented in Appendix 2 along with the photographs.

3.3. Soakaway Tests

At 7 No. locations, soakaway tests were completed and logged by SIL geotechnical engineer. BRE Special Digest 365 stipulates that the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate, then the test is deemed to have failed and the area is unsuitable for storm water drainage.

The soakaway test results and photographs are presented in Appendix 3.

3.4. California Bearing Ratio Tests

At 8 No. locations, undisturbed cylindrical mould samples will be recovered to complete California Bearing Ratio tests in the laboratory. The results facilitate the designing of the access roads and associated areas and are completed to BS1377: 1990: Part 4, Clause 7 ‘Determination of California Bearing Ratio’. The results are presented as part of Appendix 4 with the geotechnical laboratory test data.

3.5. 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 7.

4. Laboratory Testing

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

- 3 No. Moisture contents
- 3 No. Atterberg limits
- 3 No. Particle size gradings
- 3 No. pH, sulphate and chloride content

Environmental testing was completed by ALS Environmental Ltd. And this allows for a Waste Classification report to be produced. The environmental testing consists of the following:

- 3 No. Suite I analysis
- 3 No. loss on ignition tests

The geotechnical laboratory test results are presented in Appendix 4 with the environmental test results and Waste Classification report in Appendix 5 and 6 respectively.

5. Ground Conditions

5.1. MADE GROUND

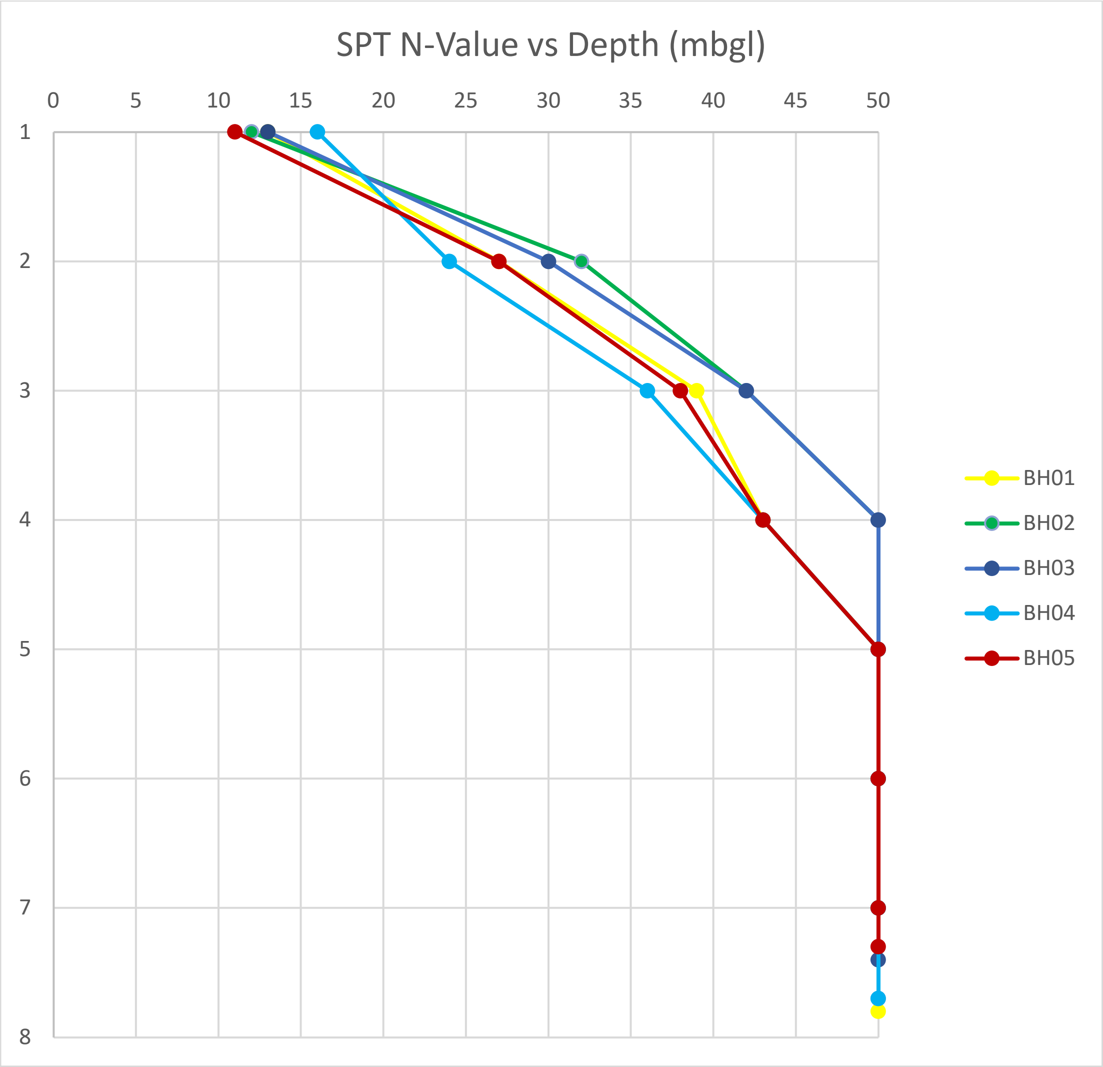
A thin layer of MADE GROUND was encountered in one trial pit, TP07, to 0.40mbgl. The soil consists of cohesive clay soils with some red brick fragments.

5.2. Overburden

The natural ground conditions are consistent with cohesive soils encountered across the site. This includes brown or grey brown overlying black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content soils. The boundary between the brown and black soils is between 1.80mbgl and 2.40mbgl and these ground conditions are encountered across the north Co. Dublin region. The boreholes terminated at similar depths ranging from 7.30mbgl to 7.80mbgl on boulder obstructions.

The SPT N-values in the natural ground at 1.00mbgl range from 11 to 16 indicating firm to stiff soils. The N-values then increase to 24 to 32 at 2.00mbgl and steadily increase with depth as the boreholes progress as shown by the graph overleaf.

Laboratory tests of the shallow cohesive soils confirm that CLAY soils dominate the site with low to intermediate plasticity indexes of 15% to 16% recorded. The particle size distribution curves were poorly sorted straight-line curves with 22% to 37% fines content.



5.3. Groundwater

Groundwater details in the boreholes and trial pits during the fieldworks are noted on the logs in Appendix 1 and 2. No groundwater ingresses were recorded during the fieldworks period.

6. 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.

As stated previously, man-made soil was recorded at TP07 to a depth of 0.40mbgl. The site is a green field site but if man-made soils are encountered in any part of the site then SIL do not recommend that narrow shallow foundations are placed on fill material due to the unknown compaction methods used during laying of man-made material. This unknown could result in softer spots and differential settlement once construction is completed. If shallow foundations are to be used and man-made soils are encountered below foundation level, then the soil should be removed and replaced with engineered fill which is compacted to the required standard.

The boreholes and the trial pits encountered firm to stiff brown and grey brown slightly sandy slightly gravelly silty CLAY at 1.00mbgl and the SPT N-values at these depths range from 11 to 16.

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. With the low to intermediate plasticity indexes recorded in the laboratory for the soils encountered on site, this correlation is C_u=6N. Therefore, using the lower value of 11, this indicates that the undrained shear strength of the CLAY is 66kN/m^2. This can be used to calculate the ultimate bearing capacity, and this has been calculated to be 355kN/m^2. Finally, a factor of safety is applied and with a factor of 3, an allowable bearing capacity of 120kN/m^2 would be anticipated using the lower SPT values.

As previously stated in Section 5.2., these soils are common across north Co. Dublin and the allowable bearing capacities for these soils are often increased to 150kN/m^2 for the brown CLAY and 250kN/m^2 to 300kN/m^2 for the deeper black CLAY.

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 trial pit walls remained stable during excavation but it would be recommended that all excavations should be checked immediately 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, no groundwater was encountered during the fieldworks. 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. Based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress (less than

2.00mbgl) into excavations of the CLAY will be slow to medium. 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. Soakaway Test

The soakaway tests failed the specification as the water level did not fall sufficiently enough to complete the test. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The tests were terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The unsuitability of the soils for soakaways is further suggested by the soil descriptions of the materials in this area of the site where the soakaway was completed, i.e., well compacted clay soils.

6.4. Pavement Design

The CBR test results in Appendix 4 indicate CBR values ranging from 7.8% to 10.2%.

The CBR samples were recovered at 0.50mbgl and inspection of the formation strata should be completed prior to construction of the pavement. Once the exact formation levels are finalised then additional in-situ testing could be completed to assist with the detailed pavement design.

6.5. Contamination

Environmental testing was carried out on three samples from the investigation and the results are shown in Appendix 5. For material to be removed from site, Suite I testing was carried out to determine if the material is hazardous or non-hazardous and then the leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill.

The Waste Classification report in Appendix 6, created using HazWasteOnline^{TM} software, shows that the material tested can be classified as non-hazardous material.

Following this analysis of the solid test results, the leachate disposal suite results showed that the determinands remained within the Inert waste thresholds.

Three samples were tested for analysis but it cannot be discounted that any localised contamination may have been missed. Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils. Additional testing of these soils may be requested by the individual landfill before acceptance and a testing regime designed by an environmental engineer would be recommended to satisfy the landfill.

6.6. Aggressive Ground Conditions

The chemical test results in Appendix 4 indicate a general pH value between 7.25 and 7.85, 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 124mg/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 149mg/l shows Class 1 conditions and no special precautions are required.

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5877

Cable Percussion Borehole Log

Borehole No: **BH01**

Contract:	Belcamp - Phase 2	Easting:	720583.775	Date Started:	11/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741451.717	Date Completed:	11/10/2021
Client:	Gannon Homes	Elevation:	30.70	Drilled By:	D. McEoin
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Depth	Stratum Description	Level (mOD) Depth
0.30	TOPSOIL.	30.40
2.20	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.	28.50
7.70	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.	23.00
7.80	Obstruction - possible boulders.	22.90

End of Borehole at 7.80m

Samples and Insitu Tests Depth	Type	Result
1.00	B	DM15
1.00	C	N=13 (2,2/2,3,4,4)
2.00	B	DM16
2.00	C	N=27 (4,6/6,6,7,8)
3.00	B	DM17
3.00	C	N=39 (4,6/8,11,10,10)
4.00	B	DM18
4.00	C	N=43 (5,9/10,11,11,11)
5.00	B	DM19
5.00	C	50 (8,11/50 for 210mm)
6.00	B	DM20
6.00	C	50 (9,12/50 for 200mm)
7.00	B	DM21
7.00	C	50 (9,13/50 for 170mm)
7.80	C	50 (25 for 5mm/50 for 5mm)

Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:
From:	To:	Time:	Strike:	Rose:	Depth Sealed	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	
7.70	7.80	01:00				11/10	7.80	Dry				0.00	7.80	Arisings	Borehole terminated due to obstruction.

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

Contract No: 5877	Cable Percussion Borehole Log	Borehole No: BH02

Cable Percussion Borehole Log

Contract:	Belcamp - Phase 2	Easting:	720115.492	Date Started:	08/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741613.046	Date Completed:	08/10/2021
Client:	Gannon Homes	Elevation:	38.15	Drilled By:	D. McEoin
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Depth	Stratum Description	Level (mOD) Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0.20	TOPSOIL.	37.95					
1.90	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.	36.25	1.00 1.00	B C	DM08 N=12 (3,3/3,2,3,4)		
7.60	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.	30.55	2.00 2.00	B C	DM09 N=32 (2,5/7,8,9,8)		
			3.00 3.00	B C	DM10 N=42 (4,6/8,11,11,12)		
			4.00 4.00	B C	DM11 50 (5,9/50 for 200mm)		
			5.00 5.00	B C	DM12 50 (7,11/50 for 125mm)		
			6.00 6.00	B C	DM13 50 (8,9/50 for 165mm)		
			7.00 7.00	B C	DM14 50 (10,11/50 for 170mm)		
7.70	Obstruction - possible boulders.	30.45	7.70	C	50 (25 for 5mm/50 for 5mm)		

End of Borehole at 7.70m

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:
7.60	7.70	01:00				08/10	7.70	Dry				0.00	7.70	Arisings	Borehole terminated due to obstruction.

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

Contract No:	Cable Percussion Borehole Log	Borehole No:
5877		**BH03**

Contract:	Belcamp - Phase 2	Easting:	719940.171	Date Started:	07/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741319.960	Date Completed:	07/10/2021
Client:	Gannon Homes	Elevation:	34.56	Drilled By:	D. McEoin
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Depth	Stratum Description	Level (mOD) Depth
0.30	TOPSOIL.	34.26
2.00	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.	32.56
7.30	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.	27.26
7.40	Obstruction - possible boulders.	27.16

End of Borehole at 7.40m

Samples and Insitu Tests Depth	Type	Result
1.00	B	DM01
1.00	C	N=13 (1,2/3,3,4,3)
2.00	B	DM02
2.00	C	N=30 (3,5/7,7,8,8)
3.00	B	DM03
3.00	C	N=42 (3,8/9,10,10,13)
4.00	B	DM04
4.00	C	50 (4,6/14,17,19,)
5.00	B	DM05
5.00	C	50 (5,8/50 for 185mm)
6.00	B	DM06
6.00	C	50 (8,10/50 for 175mm)
7.00	B	DM07
7.00	C	50 (9,11/50 for 125mm)
7.40	C	50 (25 for 5mm/50 for 0mm)

Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:
From:	To:	Time:	Strike:	Rose:	Depth Sealed	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	
7.30	7.40	01:00				07/10	7.40	Dry				0.00	7.40	Arisings	Borehole terminated due to obstruction.

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

Contract No: 5877	# Cable Percussion Borehole Log					Borehole No: **BH04**
Contract:	Belcamp - Phase 2	Easting:	720070.851	Date Started:	13/10/2021	
Location:	Balgriffin, Dublin 17	Northing:	741090.550	Date Completed:	13/10/2021	
Client:	Gannon Homes	Elevation:	34.14	Drilled By:	D. McEoin	
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL	

Depth (m)		Stratum Description	Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill
Scale	Depth			Scale	Depth	Depth	Type	Result		
	0.20	TOPSOIL.			33.94					
	2.40	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.			31.74	1.00 1.00 2.00 2.00	B C B C	DM29 N=16 (3,3/3,4,4,5) DM30 N=24 (3,4/5,5,6,8)		
	7.60	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			26.54	3.00 3.00 4.00 4.00 5.00 5.00 6.00 6.00 7.00 7.00	B C B C B C B C B C	DM31 N=36 (4,5/8,9,9,10) DM32 N=43 (5,7/10,11,10,12) DM33 N=50 (7,9/50 for 245mm) DM34 50 (5,10/50 for 225mm) DM35 50 (8,11/50 for 180mm)		
	7.70	Obstruction - possible boulders.			26.44	7.70	C	50 (25 for 5mm/50 for 0mm)		

End of Borehole at 7.70m

Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:	Legend:
From:	To:	Time:	Strike:	Rose:	Depth Sealed	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Borehole terminated due to obstruction.	B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
7.60	7.70	01:00				13/10	7.70	Dry				0.00	7.70	Arisings		

Contract No: 5877	Cable Percussion Borehole Log	Borehole No: **BH05**

Contract:	Belcamp - Phase 2	Easting:	720442.437	Date Started:	12/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741009.829	Date Completed:	12/10/2021
Client:	Gannon Homes	Elevation:	31.73	Drilled By:	D. McEoin
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m)		Stratum Description	Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill
Scale	Depth			Scale	Depth	Depth	Type	Result		
		TOPSOIL.								
	0.30	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.			31.43					
						1.00 1.00	B C	DM22 N=11 (1,1/2,2,3,4)		
						2.00 2.00	B C	DM23 N=27 (4,5/5,7,8,7)		
	2.30	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			29.43					
						3.00 3.00	B C	DM24 N=38 (5,7/9,9,10,10)		
						4.00 4.00	B C	DM25 N=43 (5,9/11,10,10,12)		
						5.00 5.00	B C	DM26 N=50 (5,8/50 for 260mm)		
						6.00 6.00	B C	DM27 50 (8,11/50 for 190mm)		
						7.00 7.00	B C	DM28 50 (7,12/50 for 20mm)		
	7.20	Obstruction - possible boulders.			24.53					
	7.30	End of Borehole at 7.30m			24.43	7.30	C	50 (25 for 5mm/50 for 5mm)		

Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:	Legend:
From:	To:	Time:	Strike:	Rose:	Depth Sealed	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Borehole terminated due to obstruction.	B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
7.20	7.30	01:00				12/10	7.30	Dry				0.00	7.30	Arisings		

Appendix 2

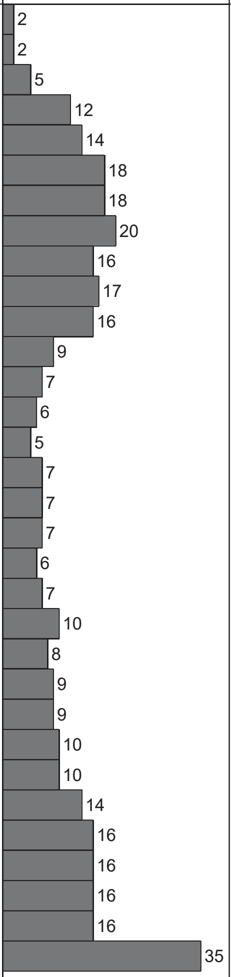
Trial Pit Logs with Dynamic Probe Results and Photographs

Contract No: 5877	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP01**
Contract:	Belcamp - Phase 2	Easting:	720660.365	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741451.213	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	31.51	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.60 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth:	Samples Depth	Samples Type
0.10	TOPSOIL.	31.41		
0.70	Soft becoming firm light brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	30.81		
2.00	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	29.51	1.20	B
3.00	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	28.51	2.50	B

Pit terminated at 3.00m

Probe



Water Strike

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

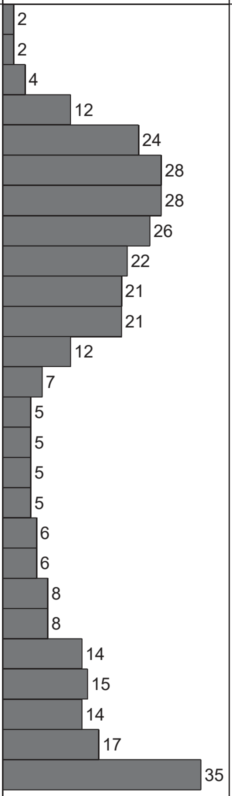
Contract No: 5877	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP02**
Contract:	Belcamp - Phase 2	Easting:	720332.270	Date:	06/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741638.561	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	35.90	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.90 x 0.60 x 2.40	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth
	TOPSOIL.	
0.20	Soft becoming firm light brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	35.70
1.10	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	34.80
1.90	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	34.00
2.40	Obstruction - boulders.	33.50

Pit terminated at 2.40m

Samples Depth	Type
1.00	B
1.50	B
2.50	B

Probe



Water Strike

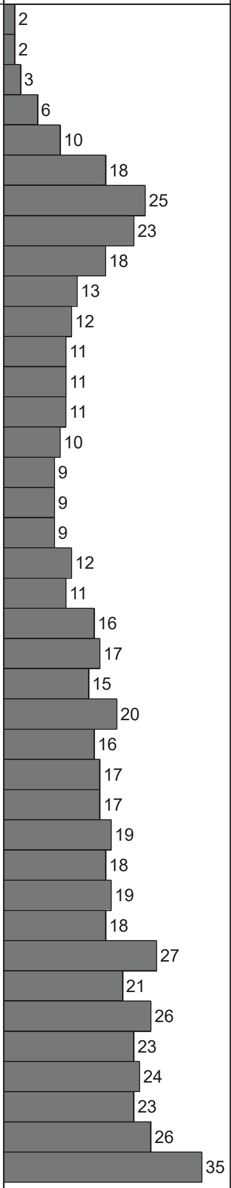
Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit and Dynamic Probe Log

Contract No: 5877				Trial Pit No: **TP03**	
Contract:	Belcamp - Phase 2	Easting:	720112.505	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741681.534	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	38.60	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
	TOPSOIL.	▨				
0.20	Light brown very silty gravelly fine to coarse SAND with medium cobble content. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	▨	38.40			
0.70	Firm becoming stiff grey brown sandy gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	▨	37.90	1.00	B	
1.90	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	▨	36.70	2.50	B	
3.00	**Pit terminated at 3.00m**		35.60			

Probe



Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5877	Trial Pit and Dynamic Probe Log				Trial Pit No: TP04
Contract:	Belcamp - Phase 2	Easting:	720145.312	Date:	06/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741457.965	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	36.99	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.60 x 0.60 x 1.80	Scale:	1:25

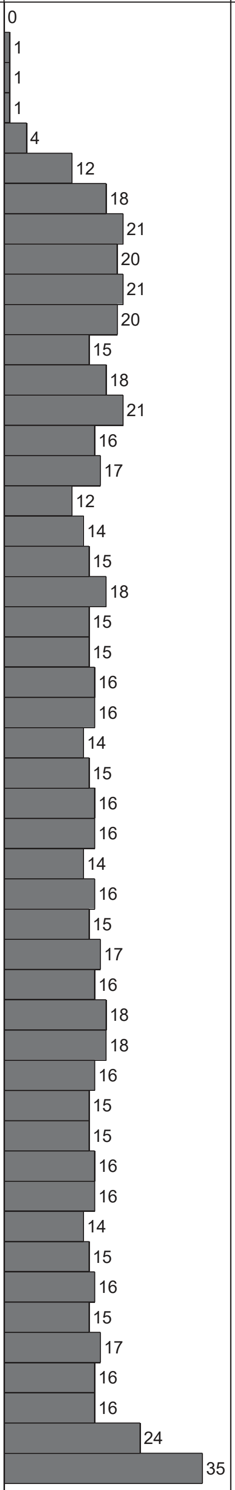
Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth:	Samples Depth	Samples Type
	TOPSOIL.	▨			
0.20	Light brown very silty gravelly fine to coarse SAND with medium cobble content. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		36.79	0.50	B
0.70	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		36.29	1.50	B
1.80	Obstruction - boulders.		35.19		

Pit terminated at 1.80m

Level (mbgl) Scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

Level (mOD) Scale: 36.5, 36.0, 35.5, 35.0, 34.5, 34.0, 33.5, 33.0, 32.5

Probe



Water Strike

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5877	# Trial Pit and Dynamic Probe Log	Trial Pit No: **TP05**

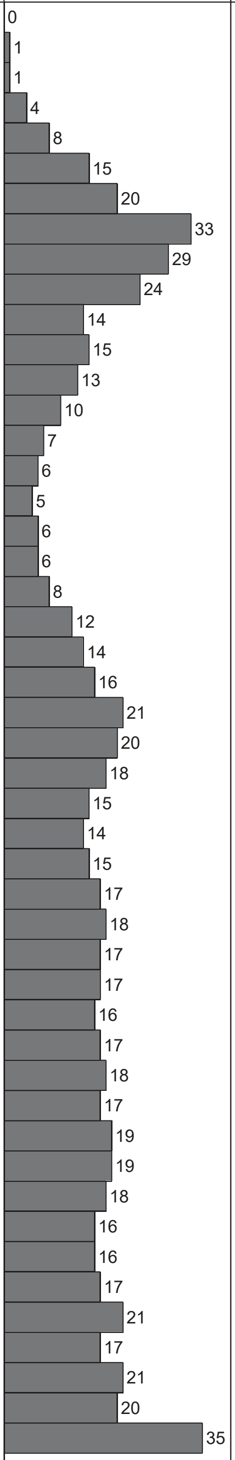
Contract:	Belcamp - Phase 2	Easting:	719985.099	Date:	06/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741438.781	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	38.14	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth:
	TOPSOIL.	
0.20	Light brown very silty gravelly fine to coarse SAND with high cobble content. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	37.94
0.80	Firm light grey brown slightly sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	37.34
1.30	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	36.84
2.30	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	35.84
3.00	**Pit terminated at 3.00m**	35.14

Samples Depth	Type
0.50	ES
1.00	B
2.00	B
2.50	B

Water Strike

Probe



Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:
Scheduled depth.	Pit walls stable.	Dry	-

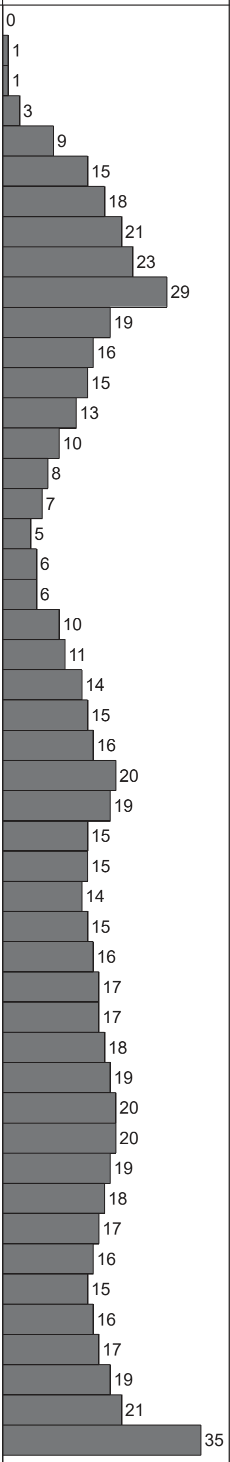
Key:

B = Bulk disturbed
D = Small disturbed
CBR = Undisturbed CBR
ES = Environmental

Contract No: 5877	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP06**
Contract:	Belcamp - Phase 2	Easting:	719961.342	Date:	06/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741260.535	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	34.48	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
	TOPSOIL.	▨				
0.20	Light brown very silty gravelly fine to coarse SAND with low cobble content. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		34.28			
0.60	Firm light grey brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		33.88	1.00	B	
1.20	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		33.28	1.50	B	
1.90	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).		32.58	2.50	B	
3.00	**Pit terminated at 3.00m**		31.48			

Probe

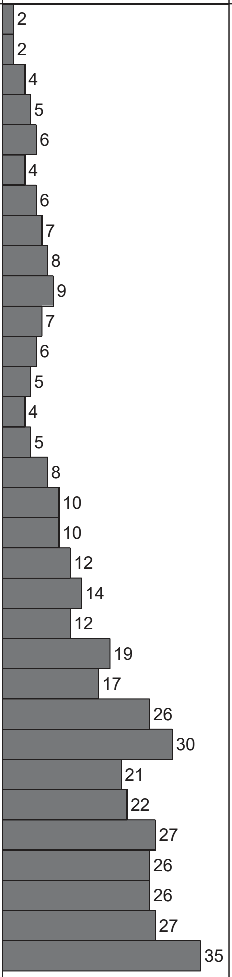


Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5877	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP07**
Contract:	Belcamp - Phase 2	Easting:	720468.482	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741361.176	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	30.72	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.20 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
	TOPSOIL.	▨				
0.20	MADE GROUND: brown sandy slightly gravelly silty clay with medium cobble content and some red brick fragments.	▦	30.52	0.30	ES	
0.40	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.		30.32	1.00	B	
2.10	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).		28.62	2.50	B	
3.00	**Pit terminated at 3.00m**		27.72			

Probe

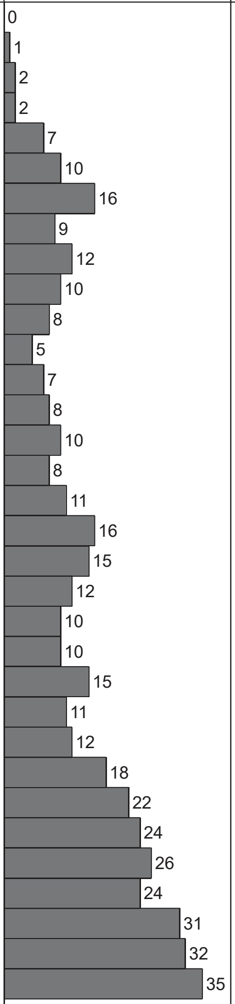


Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5877	Trial Pit and Dynamic Probe Log				Trial Pit No: **TP08**
Contract:	Belcamp - Phase 2	Easting:	720554.278	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	740969.042	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	30.04	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.90 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
	TOPSOIL.				
0.20	Soft light brown sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 300mm diameter).	29.84	0.50	ES	
0.60	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	29.44	1.00	B	
1.90	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	28.14	2.50	B	
3.00	**Pit terminated at 3.00m**	27.04			

Probe

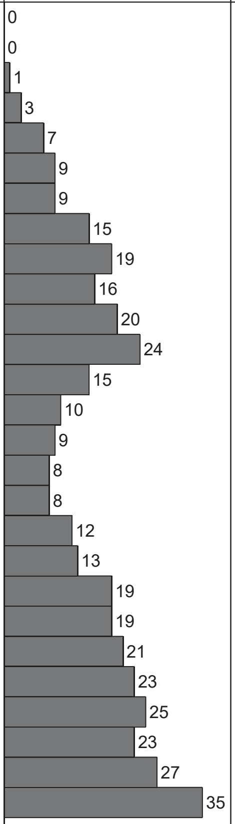


Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5877	# Trial Pit and Dynamic Probe Log				Trial Pit No: **TP09**
Contract:	Belcamp - Phase 2	Easting:	720167.202	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741042.444	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	33.95	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
	TOPSOIL.				
0.20	Soft becoming firm light brown sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	33.75	1.00	B	
1.10	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	32.85	1.50	B	
1.80	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	32.15	2.50	B	
3.00	**Pit terminated at 3.00m**	30.95			

Probe



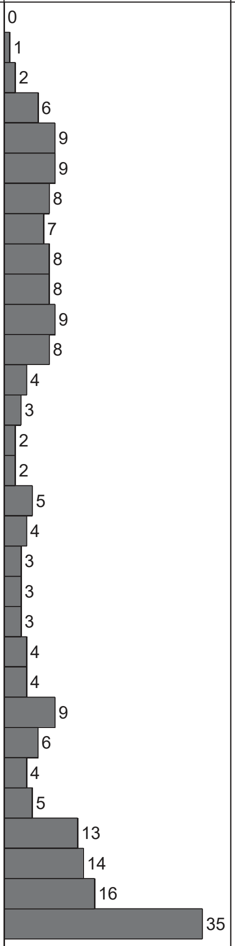
Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit and Dynamic Probe Log

Contract No: 5877				Trial Pit No: **TP10**	
Contract:	Belcamp - Phase 2	Easting:	720046.718	Date:	05/10/2021
Location:	Balgriffin, Dublin 17	Northing:	741151.617	Excavator:	JCB 3CX
Client:	Gannon Homes	Elevation:	29.83	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.50 x 0.60 x 3.00	Scale:	1:25

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth:	Samples Depth	Samples Type	Water Strike
0.20	TOPSOIL.	▨	29.63			
1.20	Soft becoming firm light brown sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	▨	28.63	1.00	B	
2.30	Firm becoming stiff grey brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles are angular to subrounded of limestone.	▨	27.53	2.00	B	
3.00	Stiff becoming very stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 400mm diameter).	▨	26.83	2.50	B	
	Pit terminated at 3.00m					

Probe



Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

TP01 Sidewall

TP01 Spoil

TP02 Sidewall

TP02 Spoil

TP03 Sidewall

TP03 Spoil

TP04 Sidewall

TP04 Spoil

TP05 Sidewall

TP05 Spoil

TP06 Sidewall

TP06 Spoil

TP07 Sidewall

TP07 Spoil

TP08 Sidewall

TP08 Spoil

TP09 Sidewall

TP09 Spoil

TP10 Sidewall

TP10 Spoil

Appendix 3

Soakaway Test Results and Photographs

SOAKAWAY TEST

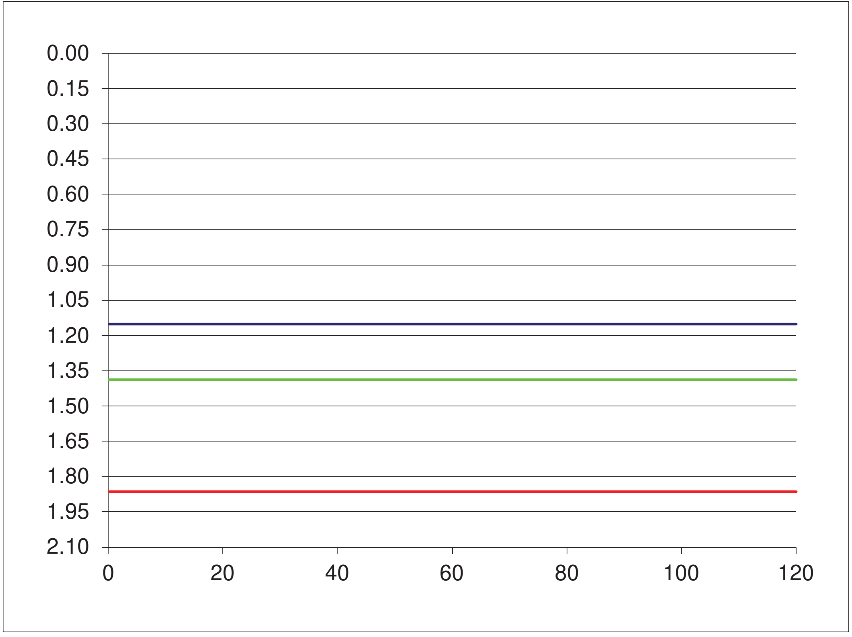
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA01
Date:	05/10/2021

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	1.10	Soft light brown sandy slightly gravelly silty CLAY with high cobble content.
1.10	1.90	Firm grey brown slightly sandy slightly gravelly silty CLAY with high cobble content.
1.90	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.15
0.5	1.15
1	1.15
1.5	1.15
2	1.15
2.5	1.15
3	1.15
3.5	1.15
4	1.15
4.5	1.15
5	1.15
6	1.15
7	1.15
8	1.15
9	1.15
10	1.15
12	1.15
14	1.15
16	1.15
18	1.15
20	1.15
25	1.15
30	1.15
40	1.15
50	1.15
60	1.15
75	1.15
90	1.15
120	1.15

Pit Dimensions (m)		
Length (m)	3.20	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.15	m
Depth of Water	0.95	m
75% Full	1.39	m
25% Full	1.86	m
75%-25%	0.48	m
Volume of water (75%-25%)	**0.91**	m3
Area of Drainage	**15.96**	m2
Area of Drainage (75%-25%)	**5.53**	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** or **Fail**

m/min **m/s**

SOAKAWAY TEST

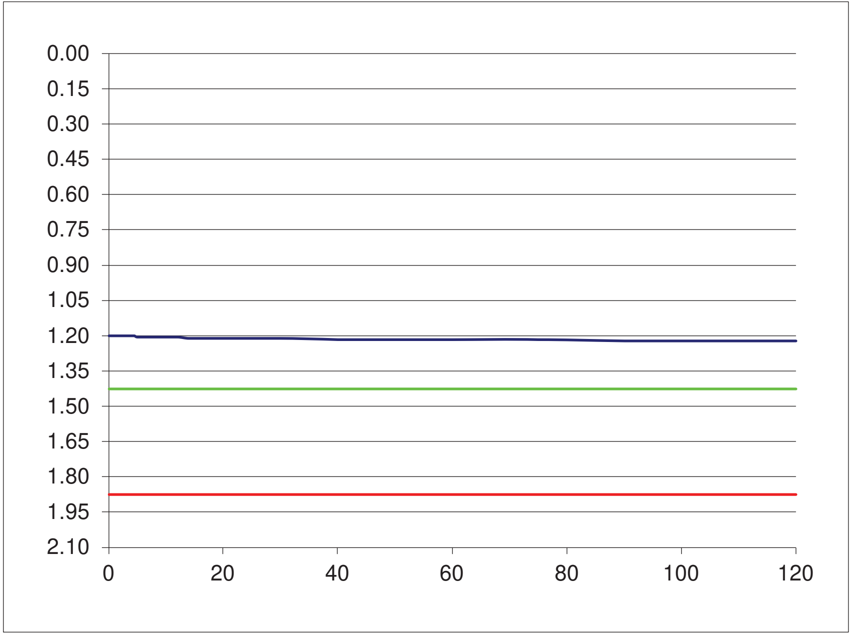
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA02
Date:	05/10/2021

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	0.90	Soft light brown sandy slightly gravelly silty CLAY with high cobble content.
0.90	1.90	Firm grey brown slightly sandy slightly gravelly silty CLAY with high cobble content.
1.90	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble 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	1.21
6	1.21
7	1.21
8	1.21
9	1.21
10	1.21
12	1.21
14	1.21
16	1.21
18	1.21
20	1.21
25	1.21
30	1.21
40	1.22
50	1.22
60	1.22
75	1.22
90	1.22
120	1.22

Pit Dimensions (m)		
Length (m)	3.40	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.20	m
Depth of Water	0.90	m
75% Full	1.43	m
25% Full	1.88	m
75%-25%	0.45	m
Volume of water (75%-25%)	**0.92**	m3
Area of Drainage	**16.80**	m2
Area of Drainage (75%-25%)	**5.64**	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**	or	**Fail**
	m/min		**m/s**

SOAKAWAY TEST

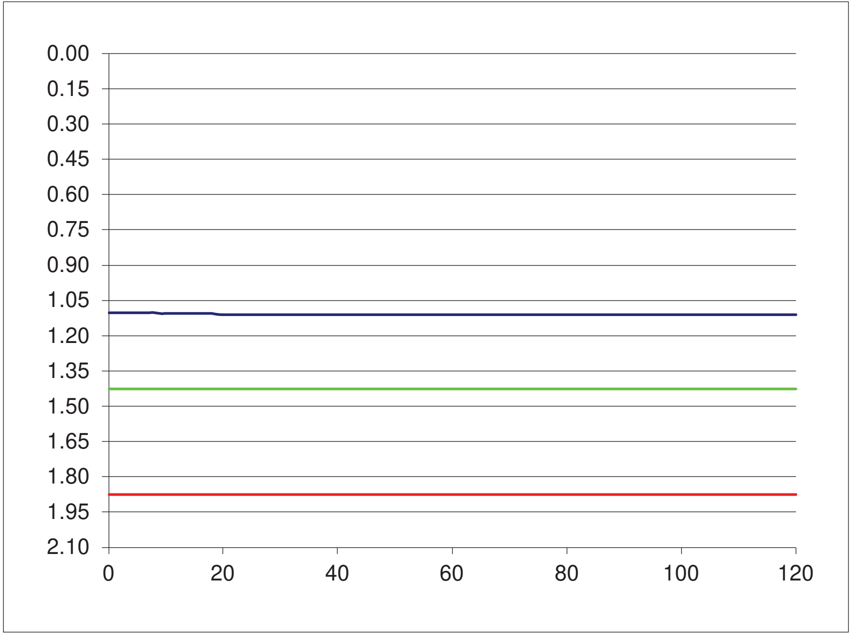
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA03
Date:	05/10/2021

Ground Conditions

From	**To**	
0.00	0.20	TOPSOIL.
0.20	0.60	Soft light brown sandy slightly gravelly silty CLAY with high cobble content.
0.60	1.90	Firm grey brown slightly sandy slightly gravelly silty CLAY with high cobble content.
1.90	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.10
0.5	1.10
1	1.10
1.5	1.10
2	1.10
2.5	1.10
3	1.10
3.5	1.10
4	1.10
4.5	1.10
5	1.10
6	1.10
7	1.10
8	1.10
9	1.11
10	1.11
12	1.11
14	1.11
16	1.11
18	1.11
20	1.11
25	1.11
30	1.11
40	1.11
50	1.11
60	1.11
75	1.11
90	1.11
120	1.11

Pit Dimensions (m)		
Length (m)	3.60	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.20	m
Depth of Water	0.90	m
75% Full	1.43	m
25% Full	1.88	m
75%-25%	0.45	m
Volume of water (75%-25%)	**0.97**	m3
Area of Drainage	**17.64**	m2
Area of Drainage (75%-25%)	**5.94**	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

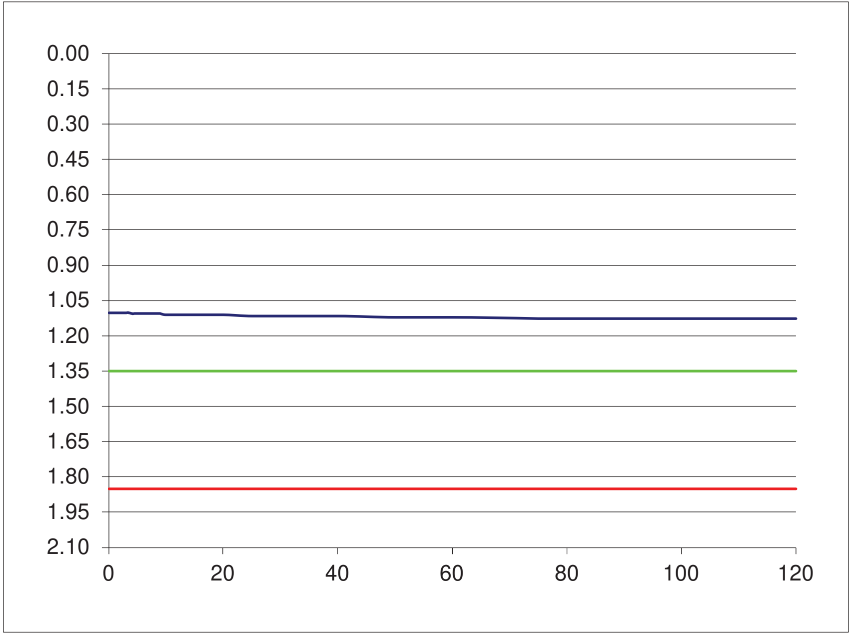
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA04
Date:	05/10/2021

Ground Conditions

From	**To**	
0.00	0.10	TOPSOIL.
0.10	0.55	Soft yellow brown sandy slightly gravelly silty CLAY with low cobble content.
0.55	0.80	Grey silty sandy GRAVEL with high cobble content.
0.80	2.10	Firm becoming stiff black slightly sandy slightly gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.10
0.5	1.10
1	1.10
1.5	1.10
2	1.10
2.5	1.10
3	1.10
3.5	1.10
4	1.11
4.5	1.11
5	1.11
6	1.11
7	1.11
8	1.11
9	1.11
10	1.11
12	1.11
14	1.11
16	1.11
18	1.11
20	1.11
25	1.12
30	1.12
40	1.12
50	1.12
60	1.12
75	1.13
90	1.13
120	1.13

Pit Dimensions (m)		
Length (m)	3.20	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.10	m
Depth of Water	1.00	m
75% Full	1.35	m
25% Full	1.85	m
75%-25%	0.50	m
Volume of water (75%-25%)	**0.96**	m3
Area of Drainage	**15.96**	m2
Area of Drainage (75%-25%)	**5.72**	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** or **Fail**

m/min **m/s**

SOAKAWAY TEST

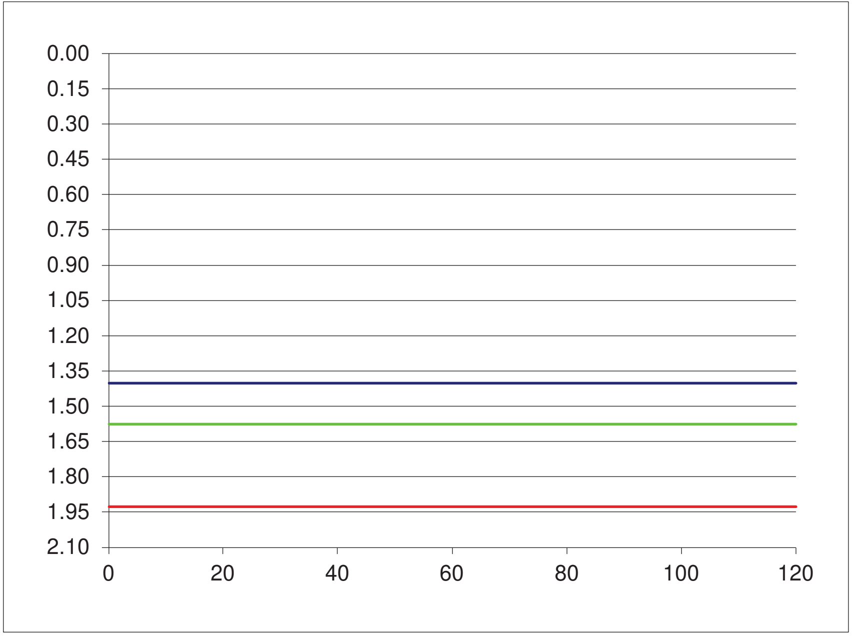
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA05
Date:	06/10/2021

Ground Conditions

From	**To**	
0.00	0.20	TOPSOIL.
0.20	0.70	Soft light brown sandy slightly gravelly silty CLAY with high cobble content.
0.70	1.60	Firm grey brown slightly sandy slightly gravelly silty CLAY with high cobble content.
1.60	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.40
0.5	1.40
1	1.40
1.5	1.40
2	1.40
2.5	1.40
3	1.40
3.5	1.40
4	1.40
4.5	1.40
5	1.40
6	1.40
7	1.40
8	1.40
9	1.40
10	1.40
12	1.40
14	1.40
16	1.40
18	1.40
20	1.40
25	1.40
30	1.40
40	1.40
50	1.40
60	1.40
75	1.40
90	1.40
120	1.40

Pit Dimensions (m)		
Length (m)	5.20	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.40	m
Depth of Water	0.70	m
75% Full	1.58	m
25% Full	1.93	m
75%-25%	0.35	m
Volume of water (75%-25%)	**1.09**	m3
Area of Drainage	**24.36**	m2
Area of Drainage (75%-25%)	**7.18**	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

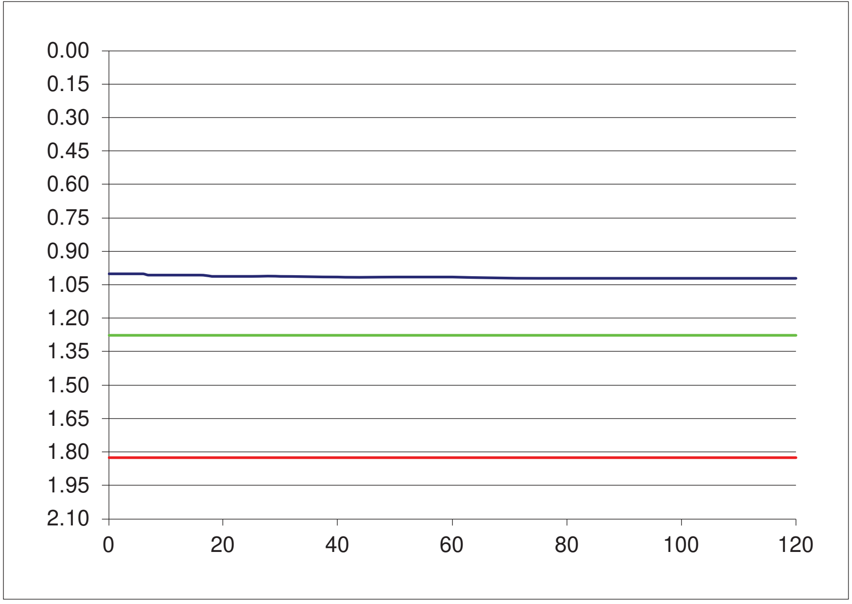
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA06
Date:	05/10/2021

Ground Conditions

From	**To**	
0.00	0.20	TOPSOIL.
0.20	0.70	Soft light brown sandy slightly gravelly silty CLAY with medium cobble
0.70	1.50	Firm light brown slightly sandy slightly gravelly silty CLAY with low cobble content.
1.50	2.10	Firm grey brown slightly sandy slightly gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.00
0.5	1.00
1	1.00
1.5	1.00
2	1.00
2.5	1.00
3	1.00
3.5	1.00
4	1.00
4.5	1.00
5	1.00
6	1.00
7	1.01
8	1.01
9	1.01
10	1.01
12	1.01
14	1.01
16	1.01
18	1.01
20	1.01
25	1.01
30	1.01
40	1.02
50	1.02
60	1.02
75	1.02
90	1.02
120	1.02

Pit Dimensions (m)		
Length (m)	3.40	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.00	m
Depth of Water	1.10	m
75% Full	1.28	m
25% Full	1.83	m
75%-25%	0.55	m
Volume of water (75%-25%)	**1.12**	m3
Area of Drainage	**16.80**	m2
Area of Drainage (75%-25%)	**6.44**	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** or **Fail**

m/min **m/s**

SOAKAWAY TEST

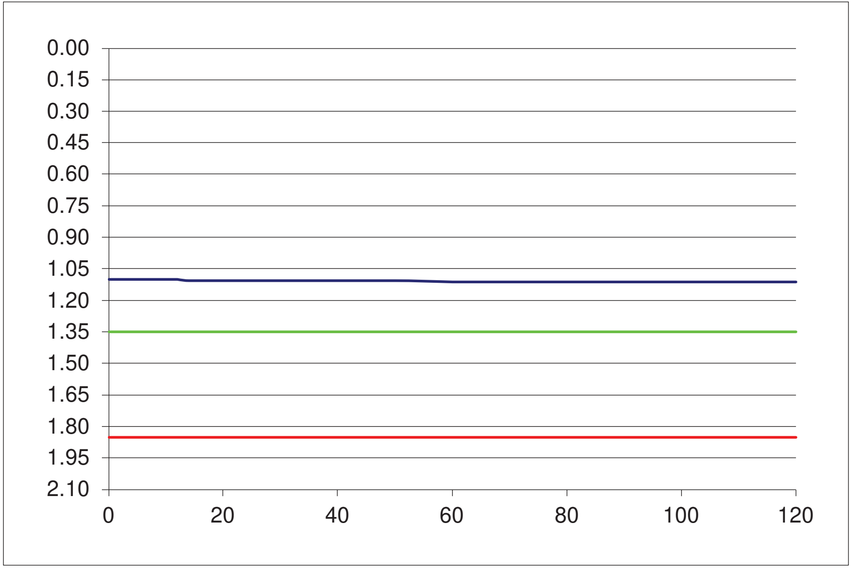
Project Reference:	5877
Contract name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Test No:	SA07
Date:	05/10/2021

Ground Conditions

From	**To**	
0.00	0.20	TOPSOIL.
0.20	0.50	Soft light brown sandy slightly gravelly silty CLAY with high cobble and low boulder content.
1.30	1.80	Firm grey brown slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content.
1.70	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with high cobble and low boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.10
0.5	1.10
1	1.10
1.5	1.10
2	1.10
2.5	1.10
3	1.10
3.5	1.10
4	1.10
4.5	1.10
5	1.10
6	1.10
7	1.10
8	1.10
9	1.10
10	1.10
12	1.10
14	1.11
16	1.11
18	1.11
20	1.11
25	1.11
30	1.11
40	1.11
50	1.11
60	1.11
75	1.11
90	1.11
120	1.11

Pit Dimensions (m)		
Length (m)	3.20	m
Width (m)	0.60	m
Depth	2.10	m
Water		
Start Depth of Water	1.10	m
Depth of Water	1.00	m
75% Full	1.35	m
25% Full	1.85	m
75%-25%	0.50	m
Volume of water (75%-25%)	**0.96**	m3
Area of Drainage	**15.96**	m2
Area of Drainage (75%-25%)	**5.72**	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** or **Fail**

m/min **m/s**

SA01 Sidewall

SA01 Spoil

SA02 Sidewall

SA02 Spoil

SA03 Sidewall

SA03 Spoil

SA04 Sidewall

SA04 Spoil

SA05 Sidewall

SA05 Spoil

SA06Sidewall

SA06 Spoil

SA07 Sidewall

SA07 Spoil

Appendix 4

Geotechnical Laboratory Test Results

Classification Tests in accordance with BS1377: Part 4

Client	Gannon Homes
Site	Belcamp - Phase 2
S.I. File No	5877 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	19th October 2021

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
TP01	1.20	MK13	21/1117	B	9.1	33	18	15			54.4		CL
TP03	1.00	MK15	21/1118	B	9.6	37	22	15			39.2		CI
TP10	1.00	MK07	21/1119	B	16.5	38	22	16			56.2		CI

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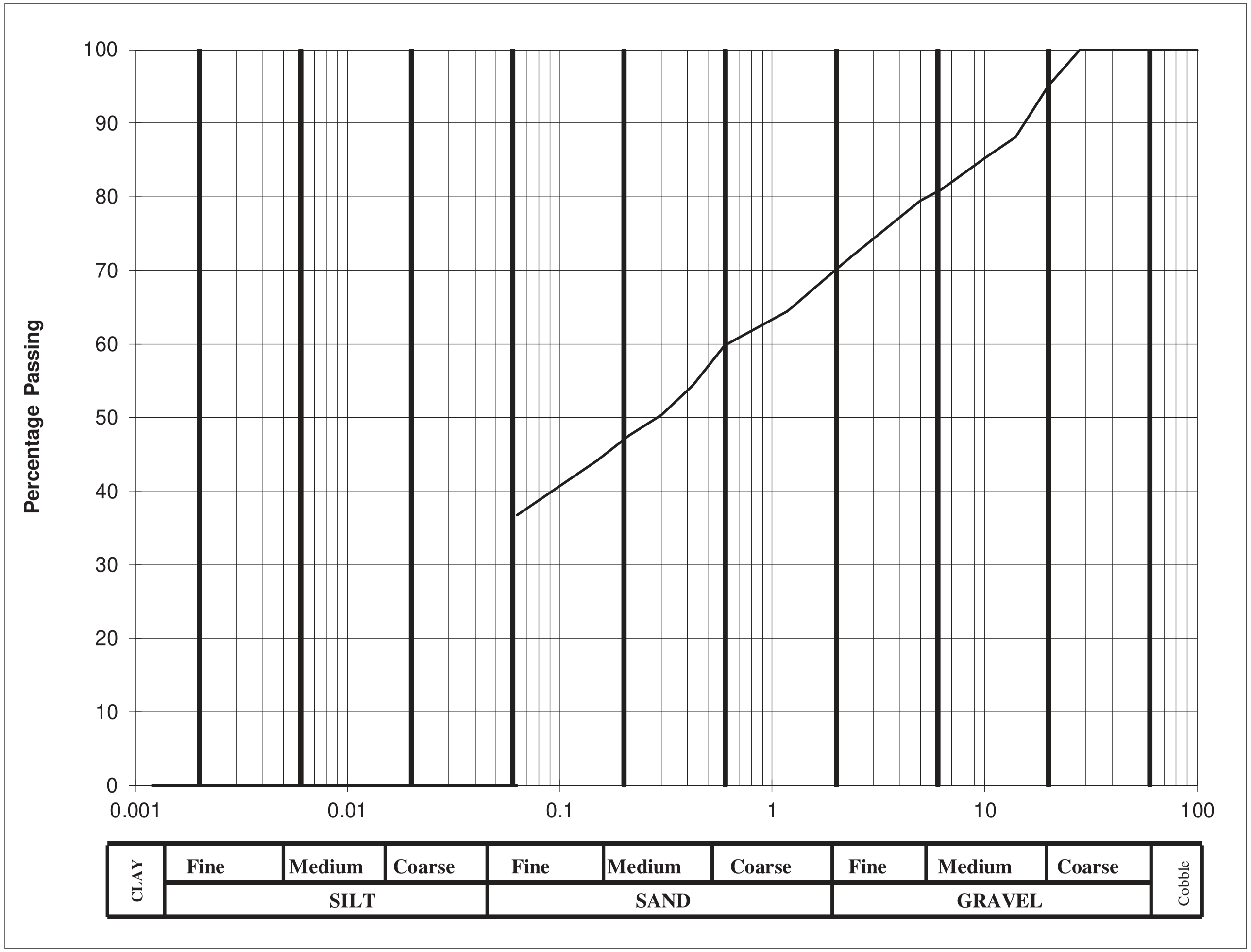
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	95.1		
14	88.1		
10	85.2		
6.3	81		
5.0	79.5		
2.36	71.9		
2.00	70.1		
1.18	64.4		
0.600	59.8		
0.425	54.4		
0.300	50.3		
0.212	47.5		
0.150	44.2		
0.063	37		

Cobbles, %	0
Gravel, %	30
Sand, %	33
Clay / Silt, %	37



Client :	Gannon Homes	Lab. No :	21/1117	Hole ID :	TP 01
Project :	Belcamp - Phase 2	Sample No :	MK13	Depth, m :	1.20

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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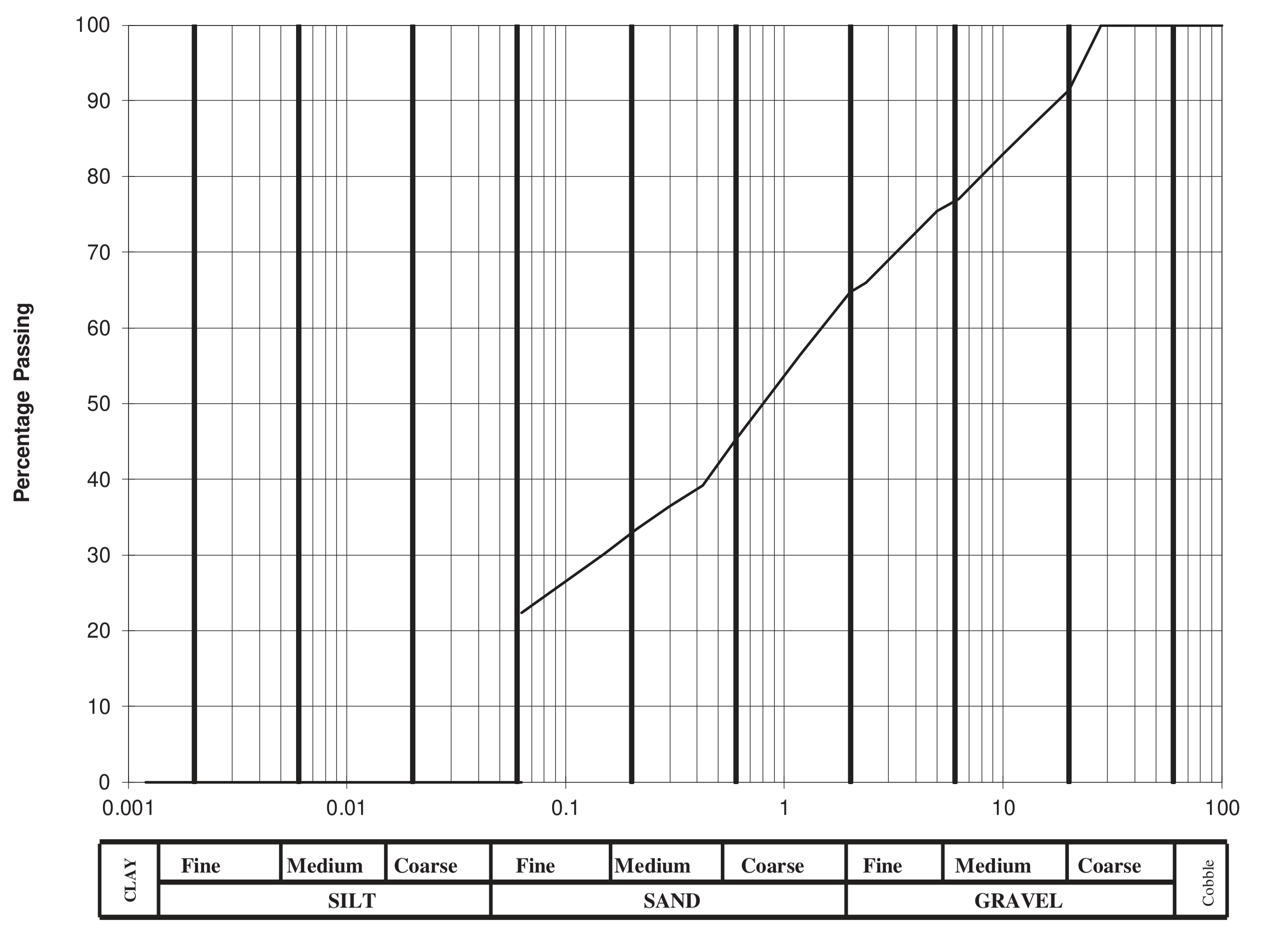
Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	91.4		
14	87.1		
10	82.9		
6.3	77		
5.0	75.4		
2.36	66		
2.00	64.7		
1.18	56.4		
0.600	45.2		
0.425	39.2		
0.300	36.5		
0.212	33.4		
0.150	30.1		
0.063	22		

Cobbles, %	0
Gravel, %	35
Sand, %	43
Clay / Silt, %	22



Client :	Gannon Homes
Project :	Belcamp - Phase 2

Lab. No :	21/1118
Sample No :	MK15

Hole ID :	TP 03
Depth, m :	1.00

Material description :	sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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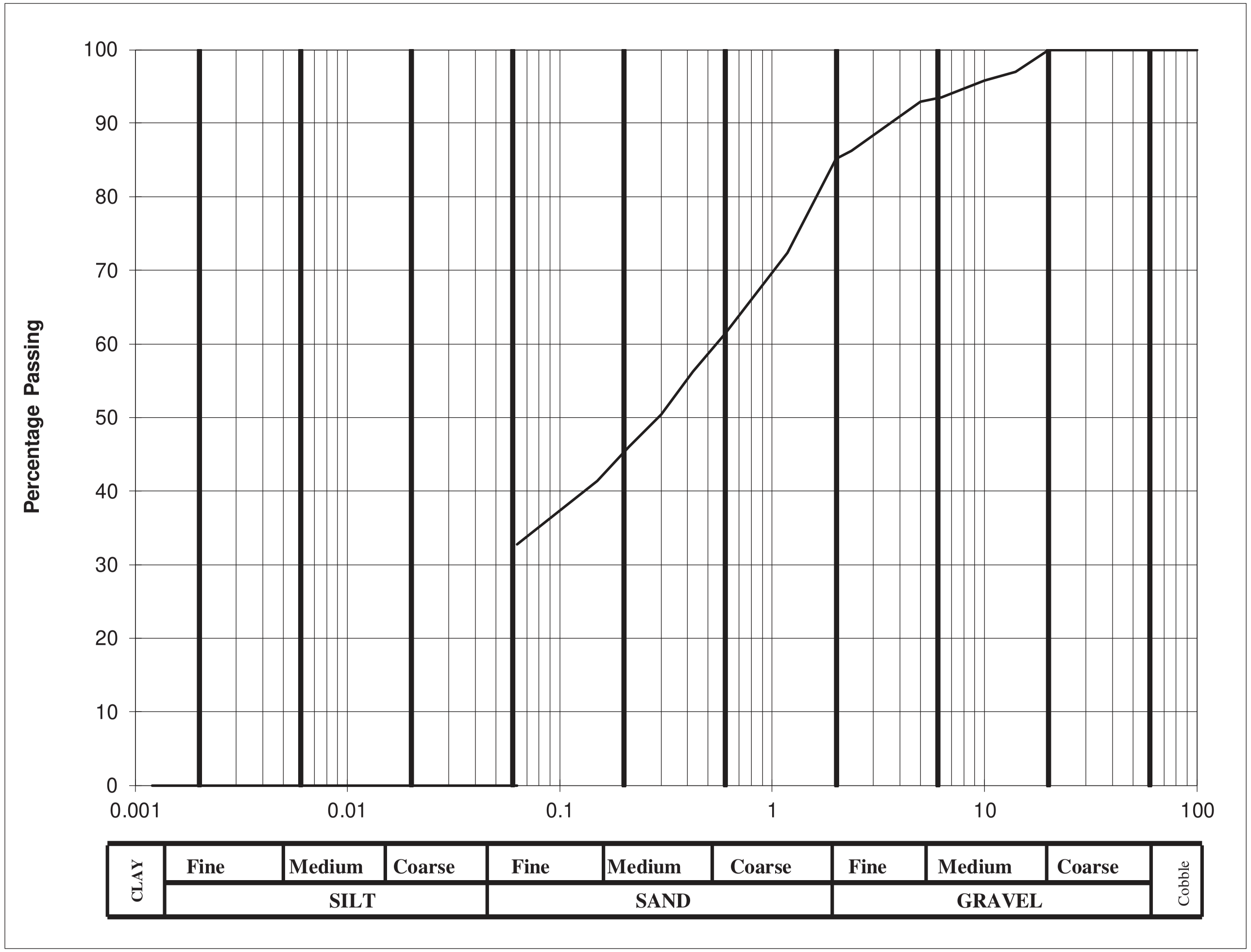
Site Investigations Ltd

BS 1377 Particle Size Analysis

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	95.8		
6.3	93.5		
5.0	92.9		
2.36	86.2		
2.00	85.1		
1.18	72.4		
0.600	61.3		
0.425	56.2		
0.300	50.4		
0.212	46		
0.150	41.4		
0.063	33		

Cobbles, %	0
Gravel, %	15
Sand, %	52
Clay / Silt, %	33



Client :	Gannon Homes	Lab. No :	21/1119	Hole ID :	TP 10
Project :	Belcamp - Phase 2	Sample No :	MK07	Depth, m :	1.00

Material description :	sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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Paddy McGonagle
Site Investigations Ltd

California Bearing Ratio (CBR) In accordance with BS1377: Part 4: Method 7

Client	Gannon Homes
Site	Belcamp - Phase 2
S.I. File No	5877 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	19th October 2021

CBR No	Depth (mBGL)	Sample No	Sample Type	Lab Ref	Moisture Content (%)	CBR Value (%)	Location / Remarks
CBR01	0.50	MK20	CBR	21/1120	18.6	7.8	
CBR02	0.50	MK21	CBR	21/1121	13.7	8.2	
CBR03	0.50	MK22	CBR	21/1122	11.9	9.5	
CBR04	0.50	MK23	CBR	21/1123	9.4	10.2	
CBR05	0.50	MK24	CBR	21/1124	15.8	8.8	
CBR06	0.50	MK25	CBR	21/1125	10.0	9.5	
CBR07	0.50	MK26	CBR	21/1126	13.1	8.5	
CBR08	0.50	MK27	CBR	21/1127	16.4	9.3	

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________________________Paddy McGonagle
Site Investigations Ltd

Chemical Testing
In accordance with BS 1377: Part 3

Client	Gannon Homes
Site	Belcamp - Phase 2
S.I. File No	5877 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	19th October 2021

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
TP01	1.20	MK13	21/1117	7.25	0.122	0.085		0.19	70.1	
TP03	1.00	MK15	21/1118	7.59	0.124	0.081		0.23	64.7	
TP10	1.00	MK07	21/1119	7.85	0.124	0.106		0.22	85.1	

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Site Investigations Ltd.

Appendix 5

Environmental Laboratory Test Results

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date of report Generation:	18 October 2021
Customer:	Site Investigations Ltd
Sample Delivery Group (SDG):	211009-33
Your Reference:	5877
Location:	Belcamp - Phase 2
Report No:	617439
Order Number:	62/A/21

We received 6 samples on Friday October 08, 2021 and 6 of these samples were scheduled for analysis which was completed on Monday October 18, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan
Operations Manager

UKAS TESTING 1291

Version: 3.1 Version Issued: 18/10/2021

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
25122274	TP01		1.20 - 1.20	07/10/2021
25122275	TP03		1.00 - 1.00	07/10/2021
25122271	TP05		0.50 - 0.50	07/10/2021
25122272	TP07		0.30 - 0.30	07/10/2021
25122273	TP08		0.50 - 0.50	07/10/2021
25122276	TP10		1.00 - 1.00	07/10/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

Results Legend

- X **Test**
- N **No Determination Possible**

Sample Types -

- S - Soil/Solid
- UNS - Unspecified Solid
- GW - Ground Water
- SW - Surface Water
- LE - Land Leachate
- PL - Prepared Leachate
- PR - Process Water
- SA - Saline Water
- TE - Trade Effluent
- TS - Treated Sewage
- US - Untreated Sewage
- RE - Recreational Water
- DW - Drinking Water Non-regulatory
- UNL - Unspecified Liquid
- SL - Sludge
- G - Gas
- OTH - Other

Lab Sample No(s)			25122274	25122275	25122271			25122272			25122273			25122276
Customer Sample Reference			TP01	TP03	TP05			TP07			TP08			TP10
AGS Reference														
Depth (m)			1.20 - 1.20	1.00 - 1.00	0.50 - 0.50			0.30 - 0.30			0.50 - 0.50			1.00 - 1.00
Container			250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)
Sample Type			S	S	S	S	S	S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 3			X			X			X			
CEN Readings	All	NDPs: 0 Tests: 3			X			X			X			
Chromium III	All	NDPs: 0 Tests: 3				X			X			X		
Coronene	All	NDPs: 0 Tests: 3				X			X			X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 3			X			X			X			
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 3			X			X			X			
EPH by GCxGC-FID	All	NDPs: 0 Tests: 3				X			X			X		
EPH CWG GC (S)	All	NDPs: 0 Tests: 3				X			X			X		
Fluoride	All	NDPs: 0 Tests: 3			X			X			X			
GRO by GC-FID (S)	All	NDPs: 0 Tests: 3					X			X			X	
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 3				X			X			X		
Loss on Ignition in soils	All	NDPs: 0 Tests: 6	X	X		X			X			X		X
Mercury Dissolved	All	NDPs: 0 Tests: 3			X			X			X			
Metals in solid samples by OES	All	NDPs: 0 Tests: 3				X			X			X		
PAH by GCMS	All	NDPs: 0 Tests: 3				X			X			X		

12:13:06 18/10/2021

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -

- S - Soil/Solid
- UNS - Unspecified Solid
- GW - Ground Water
- SW - Surface Water
- LE - Land Leachate
- PL - Prepared Leachate
- PR - Process Water
- SA - Saline Water
- TE - Trade Effluent
- TS - Treated Sewage
- US - Untreated Sewage
- RE - Recreational Water
- DW - Drinking Water Non-regulatory
- UNL - Unspecified Liquid
- SL - Sludge
- G - Gas
- OTH - Other

Lab Sample No(s)			25122274	25122275	25122271			25122272			25122273			25122276
Customer Sample Reference			TP01	TP03	TP05			TP07			TP08			TP10
AGS Reference														
Depth (m)			1.20 - 1.20	1.00 - 1.00	0.50 - 0.50			0.30 - 0.30			0.50 - 0.50			1.00 - 1.00
Container			250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)
Sample Type			S	S	S	S	S	S	S	S	S	S	S	S
PCBs by GCMS	All	NDPs: 0 Tests: 3				X			X			X		
Phenols by HPLC (W)	All	NDPs: 0 Tests: 3			X			X			X			
Sample description	All	NDPs: 0 Tests: 6	X	X		X			X			X		X
Total Dissolved Solids on Leachates	All	NDPs: 0 Tests: 3			X			X			X			
Total Organic Carbon	All	NDPs: 0 Tests: 3				X			X			X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 3				X			X			X		
VOC MS (S)	All	NDPs: 0 Tests: 3					X			X			X	

12:13:06 18/10/2021

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
25122274	TP01	1.20 - 1.20	Dark Brown	Loamy Sand	Vegetation	Stones
25122275	TP03	1.00 - 1.00	Dark Brown	Loamy Sand	Stones	Vegetation
25122271	TP05	0.50 - 0.50	Dark Brown	Loamy Sand	Stones	Vegetation
25122272	TP07	0.30 - 0.30	Dark Brown	Loamy Sand	Stones	Vegetation
25122273	TP08	0.50 - 0.50	Dark Brown	Loamy Sand	Stones	Vegetation
25122276	TP10	1.00 - 1.00	Dark Brown	Sandy Clay	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4♦§@	Sample deviation (see appendix)

		Customer Sample Ref.	TP01	TP03	TP05	TP07	TP08	TP10
		Depth (m)	1.20 - 1.20	1.00 - 1.00	0.50 - 0.50	0.30 - 0.30	0.50 - 0.50	1.00 - 1.00
		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
		Date Sampled	07/10/2021	07/10/2021	07/10/2021	07/10/2021	07/10/2021	07/10/2021
		Sample Time	.	.	.	.	.	.
		Date Received	08/10/2021	08/10/2021	08/10/2021	08/10/2021	08/10/2021	08/10/2021
		SDG Ref	211009-33	211009-33	211009-33	211009-33	211009-33	211009-33
		Lab Sample No.(s)	25122274	25122275	25122271	25122272	25122273	25122276
		AGS Reference						
Component	**LOD/Units**	**Method**						
Moisture Content Ratio (% of as received sample)	%	PM024	9.2	7	6.9	9.6	8.5	12
Loss on ignition	<0.7 %	TM018	1.66 M	1.24 M	2.1 M	2.07 M	2.09 M	4.01 M
Organic Carbon, Total	<0.2 %	TM132			0.411 M	0.432 M	0.357 M	
Chromium, Hexavalent	<0.6 mg/kg	TM151			<0.6 #	<0.6 #	<0.6 #	
PCB congener 28	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 52	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 101	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 118	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 138	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 153	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
PCB congener 180	<3 µg/kg	TM168			<3 M	<3 M	<3 M	
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168			<21	<21	<21	
Chromium, Trivalent	<0.9 mg/kg	TM181			7.28	8.67	9.73	
Antimony	<0.6 mg/kg	TM181			1.21 #	1.06 #	0.694 #	
Arsenic	<0.6 mg/kg	TM181			10.8 M	11.7 M	8.94 M	
Barium	<0.6 mg/kg	TM181			55.7 #	68.7 #	64.4 #	
Cadmium	<0.02 mg/kg	TM181			1.8 M	1.92 M	1.6 M	
Chromium	<0.9 mg/kg	TM181			7.28 M	8.67 M	9.73 M	
Copper	<1.4 mg/kg	TM181			23.5 M	25.1 M	20.2 M	
Lead	<0.7 mg/kg	TM181			13.8 M	17.8 M	13.3 M	
Mercury	<0.1 mg/kg	TM181			<0.1 M	<0.1 M	<0.1 M	
Molybdenum	<0.1 mg/kg	TM181			3.07 #	3.6 #	2.16 #	
Nickel	<0.2 mg/kg	TM181			36.7 M	36.5 M	31.7 M	
Selenium	<1 mg/kg	TM181			<1 #	<1 #	<1 #	
Zinc	<1.9 mg/kg	TM181			70.7 M	72.2 M	61.8 M	
Coronene	<200 µg/kg	TM410			<200	<200	<200	
Mineral Oil >C10-C40 (EH_2D_AL)	<5 mg/kg	TM415			<5	<5	<5	

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4♦§@	Sample deviation (see appendix)

		Customer Sample Ref.	TP05	TP07	TP08			
		Depth (m)	0.50 - 0.50	0.30 - 0.30	0.50 - 0.50			
		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
		Date Sampled	07/10/2021	07/10/2021	07/10/2021			
		Sample Time	.	.	.			
		Date Received	08/10/2021	08/10/2021	08/10/2021			
		SDG Ref	211009-33	211009-33	211009-33			
		Lab Sample No.(s)	25122271	25122272	25122273			
		AGS Reference						
Component	**LOD/Units**	**Method**						
Naphthalene	<9 µg/kg	TM218	<9 M	<9 M	<9 M			
Acenaphthylene	<12 µg/kg	TM218	<12 M	<12 M	<12 M			
Acenaphthene	<8 µg/kg	TM218	<8 M	<8 M	<8 M			
Fluorene	<10 µg/kg	TM218	<10 M	<10 M	<10 M			
Phenanthrene	<15 µg/kg	TM218	<15 M	<15 M	<15 M			
Anthracene	<16 µg/kg	TM218	<16 M	<16 M	<16 M			
Fluoranthene	<17 µg/kg	TM218	<17 M	<17 M	<17 M			
Pyrene	<15 µg/kg	TM218	<15 M	<15 M	<15 M			
Benz(a)anthracene	<14 µg/kg	TM218	<14 M	<14 M	<14 M			
Chrysene	<10 µg/kg	TM218	<10 M	<10 M	<10 M			
Benzo(b)fluoranthene	<15 µg/kg	TM218	<15 M	<15 M	<15 M			
Benzo(k)fluoranthene	<14 µg/kg	TM218	<14 M	<14 M	<14 M			
Benzo(a)pyrene	<15 µg/kg	TM218	<15 M	<15 M	<15 M			
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18 M	<18 M	<18 M			
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 M	<23 M	<23 M			
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24 M	<24 M	<24 M			
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<118	<118	<118			

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4♦§@	Sample deviation (see appendix)

Customer Sample Ref.	TP05	TP07	TP08			
Depth (m)	0.50 - 0.50	0.30 - 0.30	0.50 - 0.50			
Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled	07/10/2021	07/10/2021	07/10/2021			
Sample Time	.	.	.			
Date Received	08/10/2021	08/10/2021	08/10/2021			
SDG Ref	211009-33	211009-33	211009-33			
Lab Sample No.(s)	25122271	25122272	25122273			
AGS Reference						

Component	LOD/Units	Method	TP05	TP07	TP08			
GRO Surrogate % recovery**	%	TM089	98.6	93.1	112			
Aliphatics >C5-C6 (HS_1D_AL)	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C6-C8 (HS_1D_AL)	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C8-C10 (HS_1D_AL)	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C10-C12 (EH_2D_AL_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aliphatics >C12-C16 (EH_2D_AL_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aliphatics >C16-C21 (EH_2D_AL_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aliphatics >C21-C35 (EH_2D_AL_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aliphatics >C35-C44 (EH_2D_AL_#1)	<1000 µg/kg	TM414	<1000	<1000	<1000			
Total Aliphatics >C10-C44 (EH_2D_AR_#1)	<5000 µg/kg	TM414	<5000	<5000	<5000			
Total Aliphatics & Aromatics >C10-C44 (EH_2D_Total_#1)	<10000 µg/kg	TM414	<10000	<10000	<10000			
Aromatics >EC5-EC7 (HS_1D_AR)	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC7-EC8 (HS_1D_AR)	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC8-EC10 (HS_1D_AR)	<10 µg/kg	TM089	<10	<10	<10			
Aromatics > EC10-EC12 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aromatics > EC12-EC16 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aromatics > EC16-EC21 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aromatics > EC21-EC35 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000 #	<1000 #	<1000 #			
Aromatics >EC35-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000	<1000	<1000			
Aromatics > EC40-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414	<1000	<1000	<1000			
Total Aromatics > EC10-EC44 (EH_2D_AR_#1)	<5000 µg/kg	TM414	<5000	<5000	<5000			
Total Aliphatics & Aromatics >C5-C44 (EH_2D_Total_#1+HS_1D_Total)	<10000 µg/kg	TM414	<10000	<10000	<10000			
GRO >C5-C6 (HS_1D)	<20 µg/kg	TM089	<20	<20	<20			
GRO >C6-C7 (HS_1D)	<20 µg/kg	TM089	<20	<20	<20			
GRO >C7-C8 (HS_1D)	<20 µg/kg	TM089	<20	<20	<20			
GRO >C8-C10 (HS_1D)	<20 µg/kg	TM089	<20	<20	<20			
GRO >C10-C12 (HS_1D)	<20 µg/kg	TM089	<20	<20	<20			
Total Aliphatics >C5-C10 (HS_1D_AL_TOTAL)	<50 µg/kg	TM089	<50	<50	<50			
Total Aromatics >EC5-EC10 (HS_1D_AR_TOTAL)	<50 µg/kg	TM089	<50	<50	<50			
GRO >C5-C10 (HS_1D_TOTAL)	<20 µg/kg	TM089	<20	<20	<20			

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33
Client Ref.: 5877
Report Number: 617439
Location: Belcamp - Phase 2
Superseded Report:

VOC MS (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4♦§@	Sample deviation (see appendix)

Customer Sample Ref.	TP05	TP07	TP08			
Depth (m)	0.50 - 0.50	0.30 - 0.30	0.50 - 0.50			
Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
Date Sampled	07/10/2021	07/10/2021	07/10/2021			
Sample Time	.	.	.			
Date Received	08/10/2021	08/10/2021	08/10/2021			
SDG Ref	211009-33	211009-33	211009-33			
Lab Sample No.(s)	25122271	25122272	25122273			
AGS Reference						

Component	LOD/Units	Method	TP05	TP07	TP08			
Dibromofluoromethane**	%	TM116	113	113	117			
Toluene-d8**	%	TM116	104	97.2	106			
4-Bromofluorobenzene**	%	TM116	78.8	93.2	79.5			
Methyl Tertiary Butyl Ether	<10 µg/kg	TM116	<10 M	<10 M	<10 M			
Benzene	<9 µg/kg	TM116	<9 M	<9 M	<9 M			
Toluene	<7 µg/kg	TM116	<7 M	<7 M	<7 M			
Ethylbenzene	<4 µg/kg	TM116	<4 M	<4 M	<4 M			
p/m-Xylene	<10 µg/kg	TM116	<10 #	<10 #	<10 #			
o-Xylene	<10 µg/kg	TM116	<10 M	<10 M	<10 M			

Validated

CERTIFICATE OF ANALYSIS

SDG: 211009-33 **Report Number:** 617439 **Superseded Report:**
Client Ref.: 5877 **Location:** Belcamp - Phase 2

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Belcamp - Phase 2
Mass Sample taken (kg)	0.097	**Natural Moisture Content (%)**	7.84
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	92.7
Particle Size <4mm	>95%		

Case	
SDG	211009-33
Lab Sample Number(s)	25122271
Sampled Date	07-Oct-2021
Customer Sample Ref.	TP05
Depth (m)	0.50 - 0.50

Landfill Waste Acceptance Criteria Limits

Solid Waste Analysis	Result	Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.411	3	5	6
Loss on Ignition (%)	2.1	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg) (EH_2D_AL)	<5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2** Conc^n in 10:1 eluate (mg/l)		**A_2** 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00351	<0.0002	0.0351	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00159	<0.0003	0.0159	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00548	<0.003	0.0548	<0.03	0.5	10	30
Nickel	0.000519	<0.0004	0.00519	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.542	<0.5	5.42	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	62	<10	620	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	3.13	<3	31.3	<30	500	800	1000

Leach Test Information

Date Prepared	10-Oct-2021
pH (pH Units)	8.79
Conductivity (µS/cm)	73.40
Temperature (°C)	17.70
Volume Leachant (Litres)	0.893

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

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12:13:06 18/10/2021

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Belcamp - Phase 2
Mass Sample taken (kg)	0.100	**Natural Moisture Content (%)**	10.6
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	90.4
Particle Size <4mm	>95%		

Case	
SDG	211009-33
Lab Sample Number(s)	25122272
Sampled Date	07-Oct-2021
Customer Sample Ref.	TP07
Depth (m)	0.30 - 0.30

Landfill Waste Acceptance Criteria Limits

Solid Waste Analysis	**Result**	**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.432	3	5	6
Loss on Ignition (%)	2.07	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg) (EH_2D_AL)	<5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C_2 Conc^{n} in 10:1 eluate (mg/l)**		**A_2 10:1 conc^{n} leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00608	<0.0002	0.0608	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.000949	<0.0003	0.00949	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0162	<0.003	0.162	<0.03	0.5	10	30
Nickel	0.000786	<0.0004	0.00786	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	0.00102	<0.001	0.0102	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	64	<10	640	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	10-Oct-2021
pH (pH Units)	8.85
Conductivity (µS/cm)	83.00
Temperature (°C)	16.20
Volume Leachant (Litres)	0.890

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

18/10/2021 12:13:24

Validated

CERTIFICATE OF ANALYSIS

SDG:	211009-33	**Report Number:**	617439	**Superseded Report:**	
Client Ref.:	5877	**Location:**	Belcamp - Phase 2		

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Belcamp - Phase 2
Mass Sample taken (kg)	0.100	**Natural Moisture Content (%)**	11.3
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	89.8
Particle Size <4mm	>95%		

Case	
SDG	211009-33
Lab Sample Number(s)	25122273
Sampled Date	07-Oct-2021
Customer Sample Ref.	TP08
Depth (m)	0.50 - 0.50

Landfill Waste Acceptance Criteria Limits

Solid Waste Analysis	**Result**	**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.357	3	5	6
Loss on Ignition (%)	2.09	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg) (EH_2D_AL)	<5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	**C2** Conc^n in 10:1 eluate (mg/l)		**A2** 10:1 conc^n leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00297	<0.0002	0.0297	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00113	<0.0003	0.0113	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	<0.003	<0.003	<0.03	<0.03	0.5	10	30
Nickel	<0.0004	<0.0004	<0.004	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	<0.001	<0.001	<0.01	<0.01	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.609	<0.5	6.09	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	59	<10	590	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	3.45	<3	34.5	<30	500	800	1000

Leach Test Information

Date Prepared	10-Oct-2021
pH (pH Units)	8.89
Conductivity (µS/cm)	77.30
Temperature (°C)	16.40
Volume Leachant (Litres)	0.890

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

18/10/2021 12:13:24

12:13:06 18/10/2021

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM132	In - house Method	ELTRA CS800 Operators Guide
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM410	Shaker extraction-In house coronene method	Determination of Coronene in soils by GCMS
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM415	Analysis of Petroleum Hydrocarbons in Environmental Media.	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

Test Completion Dates

Lab Sample No(s)	25122274	25122275	25122271	25122272	25122273	25122276
Customer Sample Ref.	TP01	TP03	TP05	TP07	TP08	TP10
AGS Ref.						
Depth	1.20 - 1.20	1.00 - 1.00	0.50 - 0.50	0.30 - 0.30	0.50 - 0.50	1.00 - 1.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (w)			14-Oct-2021	14-Oct-2021	14-Oct-2021	
CEN 10:1 Leachate (1 Stage)			13-Oct-2021	13-Oct-2021	13-Oct-2021	
CEN Readings			14-Oct-2021	14-Oct-2021	14-Oct-2021	
Chromium III			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Coronene			14-Oct-2021	13-Oct-2021	13-Oct-2021	
Dissolved Metals by ICP-MS			18-Oct-2021	18-Oct-2021	18-Oct-2021	
Dissolved Organic/Inorganic Carbon			15-Oct-2021	15-Oct-2021	15-Oct-2021	
EPH by GCxGC-FID			13-Oct-2021	13-Oct-2021	13-Oct-2021	
EPH CWG GC (S)			14-Oct-2021	14-Oct-2021	14-Oct-2021	
Fluoride			15-Oct-2021	15-Oct-2021	15-Oct-2021	
GRO by GC-FID (S)			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Hexavalent Chromium (s)			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Loss on Ignition in soils	15-Oct-2021	15-Oct-2021	15-Oct-2021	15-Oct-2021	15-Oct-2021	15-Oct-2021
Mercury Dissolved			18-Oct-2021	18-Oct-2021	18-Oct-2021	
Metals in solid samples by OES			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Moisture at 105C			10-Oct-2021	10-Oct-2021	10-Oct-2021	
PAH by GCMS			13-Oct-2021	13-Oct-2021	13-Oct-2021	
PCBs by GCMS			13-Oct-2021	13-Oct-2021	12-Oct-2021	
Phenols by HPLC (W)			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Sample description	09-Oct-2021	09-Oct-2021	09-Oct-2021	09-Oct-2021	09-Oct-2021	09-Oct-2021
Total Dissolved Solids on Leachates			15-Oct-2021	15-Oct-2021	15-Oct-2021	
Total Organic Carbon			15-Oct-2021	14-Oct-2021	14-Oct-2021	
TPH CWG GC (S)			15-Oct-2021	15-Oct-2021	15-Oct-2021	
VOC MS (S)			14-Oct-2021	14-Oct-2021	15-Oct-2021	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 μm diameter, longer than 5 μm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 6

Waste Classification Report

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:
- a) understand the origin of the waste
- b) select the correct List of Waste code(s)
- c) confirm that the list of determinands, results and sampling plan are fit for purpose
- d) select and justify the chosen metal species (Appendix B)
- e) correctly apply moisture correction and other available corrections
- f) add the meta data for their user-defined substances (Appendix A)
- g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

7WNKC-OS4P5-1VI5H

Job name

5877

Description/Comments

Client: Gannon Homes
Engineer: Waterman Moylan

Project

Belcamp - Phase 2

Site

Balgriffin, Dublin 15

Classified by

Name:
Stephen Letch
Company:
Site Investigations Ltd
Date:
18 Oct 2021 14:34 GMT
Telephone:
00353 86817 9449

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: CERTIFIED

Course	**Date**
Hazardous Waste Classification	09 Oct 2019

Next 3 year Refresher due by Oct 2022

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	WAC Results		Page
					Inert	Non Haz	
1	TP05-0.50	0.50	Non Hazardous		Pass	Pass	2
2	TP07-0.30	0.30	Non Hazardous		Pass	Pass	5
3	TP08-0.50	0.50	Non Hazardous		Pass	Pass	8

Related documents

#	Name	Description
1	211009-33.hwol	.hwol file used to create the Job
2	Rilta Suite NEW	waste stream template used to create this Job

WAC results

WAC Settings: samples in this Job constitute a single population.

WAC limits used to evaluate the samples in this Job: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

Report

Created by: Stephen Letch

Created date: 18 Oct 2021 14:34 GMT

Classification of sample: TP05-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
TP05-0.50	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
0.50 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:		
6.9% (wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 6.9% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	**User entered data**	Conv. Factor	Compound conc.	**Classification value**	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1	●	TPH (C6 to C40) petroleum group				<10 mg/kg		<10 mg/kg	<0.001 %		**<LOD**
				TPH							
2	●	confirm TPH has NOT arisen from diesel or petrol				☑					
3		antimony { antimony trioxide }				1.21 mg/kg	1.197	1.349 mg/kg	0.000135 %	✓	
		051-005-00-X	215-175-0	1309-64-4							
4		arsenic { arsenic pentoxide }				10.8 mg/kg	1.534	15.423 mg/kg	0.00154 %	✓	
		033-004-00-6	215-116-9	1303-28-2							
5		barium { ● barium sulphide }				55.7 mg/kg	1.233	63.965 mg/kg	0.0064 %	✓	
		016-002-00-X	244-214-4	21109-95-5							
6		cadmium { cadmium sulfate }				1.8 mg/kg	1.855	3.108 mg/kg	0.000311 %	✓	
		048-009-00-9	233-331-6	10124-36-4							
7		copper { dicopper oxide; copper (I) oxide }				23.5 mg/kg	1.126	24.633 mg/kg	0.00246 %	✓	
		029-002-00-X	215-270-7	1317-39-1							
8		lead { ● lead compounds with the exception of those specified elsewhere in this Annex (worst case) }			1	13.8 mg/kg		12.848 mg/kg	0.00128 %	✓	
		082-001-00-6									
9		mercury { mercury dichloride }				<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		**<LOD**
		080-010-00-X	231-299-8	7487-94-7							
10		molybdenum { molybdenum(VI) oxide }				3.07 mg/kg	1.5	4.288 mg/kg	0.000429 %	✓	
		042-001-00-9	215-204-7	1313-27-5							
11		nickel { nickel sulfate }				36.7 mg/kg	2.637	90.089 mg/kg	0.00901 %	✓	
		028-009-00-5	232-104-9	7786-81-4							
12		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %		**<LOD**
		034-002-00-8									
13		zinc { zinc sulphate }				70.7 mg/kg	2.469	162.533 mg/kg	0.0163 %	✓	
		030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]							
14		chromium in chromium(III) compounds { ● chromium(III) oxide (worst case) }				7.28 mg/kg	1.462	9.906 mg/kg	0.000991 %	✓	
			215-160-9	1308-38-9							
15		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6 mg/kg	1.923	<1.154 mg/kg	<0.000115 %		**<LOD**
		024-001-00-0	215-607-8	1333-82-0							

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		naphthalene				<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
		601-052-00-2	202-049-5	91-20-3									
17	●	acenaphthylene				<0.012	mg/kg		<0.012	mg/kg	<0.0000012 %		**<LOD**
			205-917-1	208-96-8									
18	●	acenaphthene				<0.008	mg/kg		<0.008	mg/kg	<0.0000008 %		**<LOD**
			201-469-6	83-32-9									
19	●	fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-695-5	86-73-7									
20	●	phenanthrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		**<LOD**
			201-581-5	85-01-8									
21	●	anthracene				<0.016	mg/kg		<0.016	mg/kg	<0.0000016 %		**<LOD**
			204-371-1	120-12-7									
22	●	fluoranthene				<0.017	mg/kg		<0.017	mg/kg	<0.0000017 %		**<LOD**
			205-912-4	206-44-0									
23	●	pyrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		**<LOD**
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		**<LOD**
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
29	●	indeno[123-cd]pyrene				<0.018	mg/kg		<0.018	mg/kg	<0.0000018 %		**<LOD**
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.023	mg/kg		<0.023	mg/kg	<0.0000023 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
31	●	benzo[ghi]perylene				<0.024	mg/kg		<0.024	mg/kg	<0.0000024 %		**<LOD**
			205-883-8	191-24-2									
32	●	polychlorobiphenyls; PCB				<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		**<LOD**
		602-039-00-4	215-648-1	1336-36-3									
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
		603-181-00-X	216-653-1	1634-04-4									
34		benzene				<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
35		toluene				<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
36	●	ethylbenzene				<0.004	mg/kg		<0.004	mg/kg	<0.0000004 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
37	●	coronene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		**<LOD**
			205-881-7	191-07-1									
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0401 %		

Key

🟨	User supplied data
▨	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
⚛	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC results for sample: TP05-0.50

WAC Settings: samples in this Job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.411	3	5
2	LOI (loss on ignition)	%	2.1	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	<5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.118	100	-
7	pH	pH	8.79	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.0351	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0159	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	0.0548	0.5	10
16	nickel	mg/kg	0.0051	0.4	10
17	lead	mg/kg	<0.002	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	<0.01	0.1	0.5
20	zinc	mg/kg	<0.01	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	5.42	10	150
23	sulphate	mg/kg	<20	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	31.3	500	800
26	TDS (total dissolved solids)	mg/kg	620	4,000	60,000

Key

🟨 User supplied data

Classification of sample: TP07-0.30

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:		LoW Code:	
TP07-0.30		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.30 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
9.6% (wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 9.6% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	TPH (C6 to C40) petroleum group			TPH		<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
2	confirm TPH has NOT arisen from diesel or petrol					☑							
3	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		1.06	mg/kg	1.197	1.147	mg/kg	0.000115 %	✓	
4	arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		11.7	mg/kg	1.534	16.223	mg/kg	0.00162 %	✓	
5	barium { barium sulphide }	016-002-00-X	244-214-4	21109-95-5		68.7	mg/kg	1.233	76.606	mg/kg	0.00766 %	✓	
6	cadmium { cadmium sulfate }	048-009-00-9	233-331-6	10124-36-4		1.92	mg/kg	1.855	3.219	mg/kg	0.000322 %	✓	
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		25.1	mg/kg	1.126	25.547	mg/kg	0.00255 %	✓	
8	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	17.8	mg/kg		16.091	mg/kg	0.00161 %	✓	
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
10	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		3.6	mg/kg	1.5	4.882	mg/kg	0.000488 %	✓	
11	nickel { nickel sulfate }	028-009-00-5	232-104-9	7786-81-4		36.5	mg/kg	2.637	87	mg/kg	0.0087 %	✓	
12	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
13	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		72.2	mg/kg	2.469	161.168	mg/kg	0.0161 %	✓	
14	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8.67	mg/kg	1.462	11.455	mg/kg	0.00115 %	✓	
15	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
16		naphthalene 601-052-00-2	202-049-5	91-20-3		<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		**<LOD**
17	●	acenaphthylene	205-917-1	208-96-8		<0.012 mg/kg		<0.012 mg/kg	<0.0000012 %		**<LOD**
18	●	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %		**<LOD**
19	●	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		**<LOD**
20	●	phenanthrene	201-581-5	85-01-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		**<LOD**
21	●	anthracene	204-371-1	120-12-7		<0.016 mg/kg		<0.016 mg/kg	<0.0000016 %		**<LOD**
22	●	fluoranthene	205-912-4	206-44-0		<0.017 mg/kg		<0.017 mg/kg	<0.0000017 %		**<LOD**
23	●	pyrene	204-927-3	129-00-0		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		**<LOD**
24		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		**<LOD**
25		chrysene 601-048-00-0	205-923-4	218-01-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		**<LOD**
26		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		**<LOD**
27		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		**<LOD**
28		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		**<LOD**
29	●	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.018 mg/kg		<0.018 mg/kg	<0.0000018 %		**<LOD**
30		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		<0.023 mg/kg		<0.023 mg/kg	<0.0000023 %		**<LOD**
31	●	benzo[ghi]perylene	205-883-8	191-24-2		<0.024 mg/kg		<0.024 mg/kg	<0.0000024 %		**<LOD**
32	●	polychlorobiphenyls; PCB 602-039-00-4	215-648-1	1336-36-3		<0.021 mg/kg		<0.021 mg/kg	<0.0000021 %		**<LOD**
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		**<LOD**
34		benzene 601-020-00-8	200-753-7	71-43-2		<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		**<LOD**
35		toluene 601-021-00-3	203-625-9	108-88-3		<0.007 mg/kg		<0.007 mg/kg	<0.0000007 %		**<LOD**
36	●	ethylbenzene 601-023-00-4	202-849-4	100-41-4		<0.004 mg/kg		<0.004 mg/kg	<0.0000004 %		**<LOD**
37	●	coronene	205-881-7	191-07-1		<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		**<LOD**
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4] 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		**<LOD**
								Total:	0.0417 %		

Key

🟨	User supplied data
▨	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
⚛	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC results for sample: TP07-0.30

WAC Settings: samples in this Job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.432	3	5
2	LOI (loss on ignition)	%	2.07	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	<5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.118	100	-
7	pH	pH	8.85	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.0608	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0094	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	0.162	0.5	10
16	nickel	mg/kg	0.0078	0.4	10
17	lead	mg/kg	<0.002	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	<0.01	0.1	0.5
20	zinc	mg/kg	0.0102	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	<5	10	150
23	sulphate	mg/kg	<20	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	<30	500	800
26	TDS (total dissolved solids)	mg/kg	640	4,000	60,000

Key

🟨 User supplied data

Classification of sample: TP08-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:		LoW Code:	
TP08-0.50		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
0.50 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:			
8.5% (wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 8.5% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	**User entered data**		Conv. Factor	Compound conc.		**Classification value**	MC Applied	Conc. Not Used
1	●	TPH (C6 to C40) petroleum group			TPH		<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
2	●	confirm TPH has NOT arisen from diesel or petrol					☑							
3		antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		0.694	mg/kg	1.197	0.76	mg/kg	0.000076 %	✓	
4		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		8.94	mg/kg	1.534	12.547	mg/kg	0.00125 %	✓	
5		barium { ● barium sulphide }	016-002-00-X	244-214-4	21109-95-5		64.4	mg/kg	1.233	72.685	mg/kg	0.00727 %	✓	
6		cadmium { cadmium sulfate }	048-009-00-9	233-331-6	10124-36-4		1.6	mg/kg	1.855	2.715	mg/kg	0.000272 %	✓	
7		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20.2	mg/kg	1.126	20.81	mg/kg	0.00208 %	✓	
8		lead { ● lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	13.3	mg/kg		12.17	mg/kg	0.00122 %	✓	
9		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		**<LOD**
10		molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		2.16	mg/kg	1.5	2.965	mg/kg	0.000296 %	✓	
11		nickel { nickel sulfate }	028-009-00-5	232-104-9	7786-81-4		31.7	mg/kg	2.637	76.478	mg/kg	0.00765 %	✓	
12		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		**<LOD**
13		zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		61.8	mg/kg	2.469	139.631	mg/kg	0.014 %	✓	
14		chromium in chromium(III) compounds { ● chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9.73	mg/kg	1.462	13.012	mg/kg	0.0013 %	✓	
15		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		**<LOD**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
16		naphthalene 601-052-00-2	202-049-5	91-20-3		<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		<LOD
17	●	acenaphthylene	205-917-1	208-96-8		<0.012 mg/kg		<0.012 mg/kg	<0.0000012 %		<LOD
18	●	acenaphthene	201-469-6	83-32-9		<0.008 mg/kg		<0.008 mg/kg	<0.0000008 %		<LOD
19	●	fluorene	201-695-5	86-73-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
20	●	phenanthrene	201-581-5	85-01-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
21	●	anthracene	204-371-1	120-12-7		<0.016 mg/kg		<0.016 mg/kg	<0.0000016 %		<LOD
22	●	fluoranthene	205-912-4	206-44-0		<0.017 mg/kg		<0.017 mg/kg	<0.0000017 %		<LOD
23	●	pyrene	204-927-3	129-00-0		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
24		benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		<LOD
25		chrysene 601-048-00-0	205-923-4	218-01-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
26		benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
27		benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		<0.014 mg/kg		<0.014 mg/kg	<0.0000014 %		<LOD
28		benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		<0.015 mg/kg		<0.015 mg/kg	<0.0000015 %		<LOD
29	●	indeno[123-cd]pyrene	205-893-2	193-39-5		<0.018 mg/kg		<0.018 mg/kg	<0.0000018 %		<LOD
30		dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		<0.023 mg/kg		<0.023 mg/kg	<0.0000023 %		<LOD
31	●	benzo[ghi]perylene	205-883-8	191-24-2		<0.024 mg/kg		<0.024 mg/kg	<0.0000024 %		<LOD
32	●	polychlorobiphenyls; PCB 602-039-00-4	215-648-1	1336-36-3		<0.021 mg/kg		<0.021 mg/kg	<0.0000021 %		<LOD
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X	216-653-1	1634-04-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34		benzene 601-020-00-8	200-753-7	71-43-2		<0.009 mg/kg		<0.009 mg/kg	<0.0000009 %		<LOD
35		toluene 601-021-00-3	203-625-9	108-88-3		<0.007 mg/kg		<0.007 mg/kg	<0.0000007 %		<LOD
36	●	ethylbenzene 601-023-00-4	202-849-4	100-41-4		<0.004 mg/kg		<0.004 mg/kg	<0.0000004 %		<LOD
37	●	coronene	205-881-7	191-07-1		<0.2 mg/kg		<0.2 mg/kg	<0.00002 %		<LOD
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4] 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
								Total:	0.0367 %		

Key

🟨	User supplied data
⬜	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
⚛	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC results for sample: TP08-0.50

WAC Settings: samples in this Job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.357	3	5
2	LOI (loss on ignition)	%	2.09	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	<5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.118	100	-
7	pH	pH	8.89	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.0297	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0113	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	<0.03	0.5	10
16	nickel	mg/kg	<0.004	0.4	10
17	lead	mg/kg	<0.002	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	<0.01	0.1	0.5
20	zinc	mg/kg	<0.01	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	6.09	10	150
23	sulphate	mg/kg	<20	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	34.5	500	800
26	TDS (total dissolved solids)	mg/kg	590	4,000	60,000

Key

🟨 User supplied data

Appendix A: Classifier defined and non CLP determinands

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

confirm TPH has NOT arisen from diesel or petrol

Description/Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

barium sulphide (EC Number: 244-214-4, CAS Number: 21109-95-5)

CLP index number: 016-002-00-X
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): EUH031 >= 0.8 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

lead compounds with the exception of those specified elsewhere in this Annex (worst case)

CLP index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following CLP protocols, considers lead compounds from smelting industries, flue dust and similar to be Carcinogenic category 1A
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

● **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

● **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

● **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

● **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

● **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

● **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

● **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

● **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case scenario.

arsenic {arsenic pentoxide}

Arsenic pentoxide used as most hazardous species.

barium {barium sulphide}

Chromium VII at limits of detection. Barium sulphide used as the next most hazardous species. No chromate present.

cadmium {cadmium sulfate}

Cadmium sulphate used as the most hazardous species.

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected.

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

Chromium VII at limits of detection. Lead compounds used as the next most hazardous species. No chromate present.

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight.

nickel {nickel sulfate}

Chromium VII at limits of detection. Nickel sulphate used as the next most hazardous species. No chromate present.

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil.

zinc {zinc sulphate}

Chromium VII at limits of detection. Zinc sulphate used as the next most hazardous species. No chromate present.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2021.246.4869.9247 (05 Sep 2021)
HazWasteOnline Database: 2021.246.4869.9247 (05 Sep 2021)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2019 - UK: 2019 No. 720 of 27th March 2019
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

Appendix 7

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
BH01	720583.775	741451.717	30.70	320659.096	241427.058
BH02	720115.492	741613.046	38.15	320190.712	241588.418
BH03	719940.171	741319.960	34.56	320015.356	241295.268
BH04	720070.851	741090.550	34.14	320146.066	241065.809
BH05	720442.437	741009.829	31.73	320517.732	240985.073
Trial Pits					
TP01	720660.365	741451.213	31.51	320735.702	241426.554
TP02	720332.270	741638.561	35.90	320407.536	241613.940
TP03	720112.505	741681.534	38.60	320187.723	241656.921
TP04	720145.312	741457.965	36.99	320220.540	241433.304
TP05	719985.099	741438.781	38.14	320060.293	241414.115
TP06	719961.342	741260.535	34.48	320036.532	241235.830
TP07	720468.482	741361.176	30.72	320543.779	241336.496
TP08	720554.278	740969.042	30.04	320629.598	240944.278
TP09	720167.202	741042.444	33.95	320242.438	241017.693
TP10	720046.718	741151.617	29.83	320121.928	241126.889
Soakaway Tests					
SA01	720595.652	741502.326	32.93	320670.975	241477.678
SA02	720457.080	741498.613	34.23	320532.374	241473.963
SA03	719961.448	741610.544	38.78	320036.635	241585.915
SA04	720068.593	741177.857	28.50	320143.807	241153.135
SA05	720169.238	741260.896	31.64	320244.473	241236.192
SA06	720223.948	741174.061	28.86	320299.195	241149.339
SA07	720596.192	741081.792	27.58	320671.520	241057.052
California Bearing Ratio Tests					
CBR01	720958.551	741361.369	23.91	321033.953	241336.692
CBR02	720674.063	741364.391	27.41	320749.404	241339.713
CBR03	720397.803	741448.380	34.63	320473.085	241423.719
CBR04	720229.573	741515.020	35.93	320304.818	241490.372
CBR05	719895.984	741535.588	37.55	319971.158	241510.942
CBR06	720044.442	741776.774	38.39	320119.645	241752.181
CBR07	720221.611	741270.305	32.57	320296.857	241245.604
CBR08	720340.894	741004.301	31.96	320416.168	240979.543

Legend Key

- ● Locations By Type - CP
- ○ Locations By Type - ICBR
- ☐ Locations By Type - IP
- ▨ Locations By Type - TP

Contract No:	5877
Contract Name:	Belcamp - Phase 2
Location:	Balgriffin, Dublin 17
Client:	Gannon Homes
Engineer:	Waterman Moylan
Title:	Site Plan
Scale:	1:5500
Drawn By:	SL

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

APPENDIX 7.1: CONFIRMATION OF FEASIBILITY

UISCE
ÉIREANN : IRISH
WATER

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Darragh Aiken
Waterman Moylan
Eastopoint Business Park, Block S,
Alfie Byrne Road,
Dublin 3
D03H3F4

23 April 2020

Dear Jim Kenny,

Re: Connection Reference No CDS20001888 pre-connection enquiry -
Subject to contract | Contract denied

Connection for Housing Development of 4,651 units at Belcamp Lands, Malahide Road, Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at Belcamp Lands, Malahide Road, Dublin.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated subject to following:

Water

- The connection should be installed on 600mm DI main in R139 road and should include installation of an offtake with a PRV controller and a bulk meter with associated telemetry system.
- Secondary connection should be installed on 300mm DI main in R139 with closed valve during normal operation.
- On site storage will be required for the average day peak week demand (1.45l/s) of the commercial section with 24 hours storage and 12 hours re-fill time.

Wastewater

- The connection into the 1050 mm trunk sewer is feasible without upgrade.
- The proposed development indicates that important Irish Water assets are present on the site (1050 mm and 375 mm sewer). Also, site for future wastewater treatment plant is adjacent to the Development. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the infrastructure during and after the works. In advance of obtaining final planning permission the developer is requested to contact Irish Water to agree the required separation distances or proposed diversion associated with the infrastructure. For further information related to diversion please visit www.water.ie/connections/developer-services/diversions

More detailed Local Network Plan (Master Plan) of the Development Area, including water distribution and wastewater collection networks servicing the planned building blocks, is required. The Plan has to be reviewed and approved by Irish Water. The networks should be appropriately designed and suitably sized to provide effective and economical management of the networks with minimum number of pumping stations.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and wastewater infrastructure should be submitted to Irish Water for assessment.

Prior to submitting your planning application, you are required to submit these design proposals to Irish Water for review.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water’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.

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

M. O'Dwyer

Maria O’Dwyer

Connections and Developer Services

APPENDIX 7.2: STATEMENT OF DESIGN ACCEPTANCE

UISCE ÉIREANN : IRISH WATER

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Darrgh Aiken
Waterman Moylan
Block S Eastpoint Business Park
Alfie Byrne Road
Dublin
D03 H3F4

28 April 2022

Re: Design Submission for Belcamp Lands, Malahide Road, Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS20001888

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, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water'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 Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Fionán Ginty
Phone: 01 89 25734
Email: fginty@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- P2000 Drainage General Arrangement
- P2100 Drainage Layout Sheet 1 of 11
- P2101 Drainage Layout Sheet 2 of 11
- P2102 Drainage Layout Sheet 3 of 11
- P2103 Drainage Layout Sheet 4 of 11
- P2104 Drainage Layout Sheet 5 of 11
- P2105 Drainage Layout Sheet 6 of 11
- P2106 Drainage Layout Sheet 7 of 11
- P2107 Drainage Layout Sheet 8 of 11
- P2108 Drainage Layout Sheet 9 of 11
- P2109 Drainage Layout Sheet 10 of 11
- P2110 Drainage Layout Sheet 11 of 11

- P3000 Watermain District Metered Areas
- P3100 Watermain General Arrangement
- P3101 Watermain Layout Sheet 1 of 11
- P3102 Watermain Layout Sheet 2 of 11
- P3103 Watermain Layout Sheet 3 of 11
- P3104 Watermain Layout Sheet 4 of 11
- P3105 Watermain Layout Sheet 5 of 11
- P3106 Watermain Layout Sheet 6 of 11
- P3107 Watermain Layout Sheet 7 of 11
- P3108 Watermain Layout Sheet 8 of 11
- P3109 Watermain Layout Sheet 9 of 11
- P3110 Watermain Layout Sheet 10 of 11
- P3111 Watermain Layout Sheet 11 of 11

Additional Comments:

- The design submission, including proposed connection points, will be subject to further technical review at connection application stage.

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 Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

APPENDIX 8.1: Dust Management Plan

Site management

The aim is to ensure good site management by avoiding dust becoming airborne at source. At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions. As the prevailing wind is predominantly south-westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur. The Principal Contractor or equivalent must ensure that the proposed mitigation measures are implemented, and that dust impacts and nuisance are minimised.

- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary. A complaints register will be kept on site detailing all sources of complaints received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out.
- Regular inspections of the site and boundary should be carried out to monitor dust, records and notes on these inspections should be logged.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
- In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed, and satisfactory procedures implemented to rectify the problem.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site if necessary.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover or fence stockpiles to prevent wind whipping.

Site roads and operating vehicles / machinery

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads.
- Access gates to the site shall be located at least 10m from sensitive receptors where possible.

- Bowsers or suitable watering equipment will be available during periods of dry weather. Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist.
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.
- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

Site traffic on public roads

- Vehicles delivering material with potential for dust emissions to an off-site location shall be enclosed or covered with tarpaulin at all times.
- At the main construction traffic exit, a wheel wash facility shall be installed. All trucks leaving the site must pass through the wheel wash. The wheel wash will be located sufficiently far from the exit to allow trucks to ‘drip off’ prior to exit. In addition, public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary.
- Vehicles onsite shall turn off engines when not in use to prevent idling emissions.

Onsite operations

- Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays.
- Ensure an adequate water supply on the site for effective dust / particulate matter suppression.
- Use enclosed chutes and conveyors and covered skips.
- Avoid dry sweeping of large areas.
- Minimise drop heights from conveyors and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event.

Waste management

- Avoid bonfires and burning of waste materials.

Demolition activities

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Earthwork’s activities

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser or similar will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Construction activities

- Ensure aggregates are stored in bunded areas and are not allowed to dry out unless this is required for a particular process.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately.
- During periods of very high winds (gales), construction activities likely to generate significant dust emissions should be postponed until the gale has subsided.

APPENDIX 11.1: VERIFIED PHOTOMONTAGES

digital dimensions
architectural visualisation

Belcamp SHD

Verified Photomontages & Computer-generated imagery (CGIs)

Our Ref: 22-010 Belcamp SHD_print

NOTES AND METHODOLOGY

PROJECT DETAILS

Title: Belcamp SHD

Design team:
Gerard Gannon Properties
CCK Archhitects
Wilson Architecture
TBS Studio
RMDA Landscape Architecture
Downey Planning

Prepared by Digital Dimensions

Issue Date	02/05/22	03/05/22				
Revision	A	B				
Status	FOR APPROVAL	FOR PRINT				

PROFILE

Digital Dimensions are specialists in computer generated visualisations for all forms of planning applications. The company was established in 2000 by John Healy and Jim Manning in Dublin, Ireland. Digital Dimensions is one of Ireland's leading architectural visualisation companies with 20+ years of experience covering a wide range of solutions in the areas of architectural visualisation, environmental design and digital media.

Method Statement - Photo-montage production using guidance in
The Landscape Institute TGN-06-19 Visual Representation of Development Proposals.

1. Photographs are taken from locations as advised by the planning consultant with a full frame SLR digital camera and prime lens. Photographs are taken using the most appropriate combination of lens focal lengths to ensure that the field of view covers the proposed scheme environment or landscape context. The photographs are taken horizontally with a survey level attached to the camera. The photographic positions are marked (for later surveying), the height of the camera and the focal length of the image recorded.

2. In each photograph, a minimum of 3no. visible fixed points are marked for surveying. These are control points for model alignment within the photograph. All surveying is carried out by a qualified topographical surveyor using Total Station / GPS devices.

3. The photographic positions and the control points are geographically surveyed and this survey is tied in to the site topographical survey supplied by the Architect / client.

4. The buildings are accurately modelled in 3D cad software from cad drawings or BIM model supplied by the Architect. Material finishes are applied to the 3D model and scene element are place like trees and planting to represent the proposed landscaping.

5. Virtual 3D cameras are positioned according to the survey co-ordinates and the focal length is set to match the photograph. Pitch and rotation are adjusted using the survey control points to align the virtual camera to the photograph. Lighting is set to match the time of day the photograph is taken.

6. The proposed development is output from the 3D software using this camera and the image is then blended with the original photograph to give an accurate image of what the proposed development will look like in its proposed setting.

7. In the event of the development not being visible, the roof line of the development will be outlined in red if re-quested.

8. The document contains:

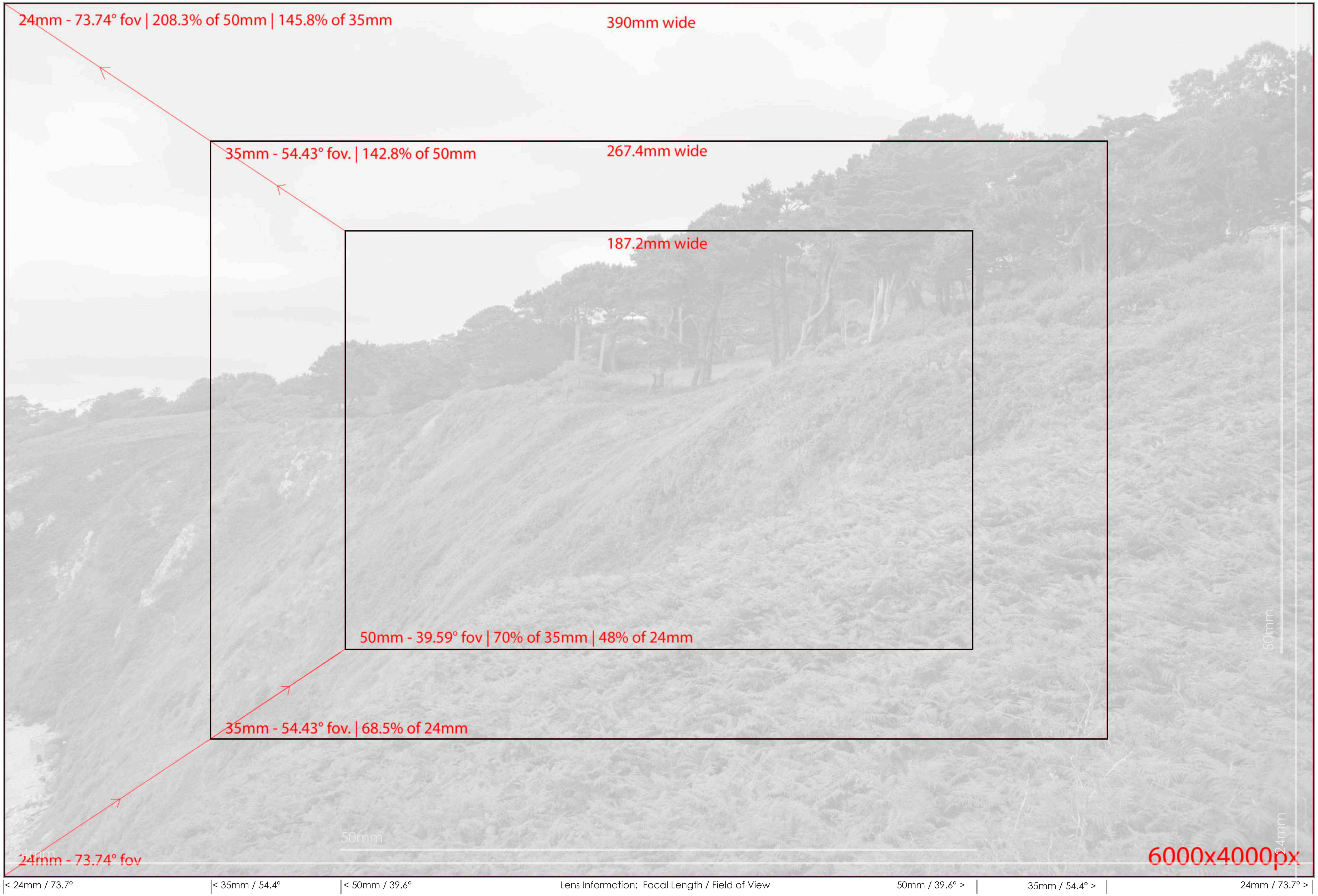
   a. Site location map with view locations plotted.
   b. Photomontage sheets with existing and proposed conditions.
   c. Reference information including field of view/focal length, range to site / development, date of photograph.

9. For the views, we provide two images:

   a. The existing view on various dates in October 2022);
   b. The proposed photomontage (or scheme outline as appropriate)

View Location Map - not to scale

This map is for view location purposes only. Please refer to Architects drawings for site layout and redline boundary.



Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
						Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 1 Existing	Looking South from end of Carr's Lane	30/10/21	73.7°	24mm	11.2m	Canon EOS 5DS

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 1 Proposed	Looking South from end of Carr's Lane	30/10/21	73.7°	24mm	11.2m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 2 Existing	Looking South from outside No 8, Limekiln Lane	30/10/21	73.7°	24mm	387m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 2 Proposed	Looking South from outside No 8, Limekiln Lane	30/10/21	73.7°	24mm	387m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 3 Existing	Looking South from Baskin Cottages	30/10/21	73.7°	24mm	1169m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 3 Proposed	Looking South from Baskin Cottages	30/10/21	73.7°	24mm	1169m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 4 Existing	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	1057m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 4 Proposed	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	1057m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 5 Existing	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	920m	Canon EOS 5DS

digital dimensions
architectural visualisation

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 5 Proposed	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	920m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 6 Existing	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	909m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 6 Proposed	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	909m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 7 Existing	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	914m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 7 Proposed	Looking East from Clonshaugh Road	30/10/21	73.7°	24mm	914m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 8 Existing	Looking East from Clayton Hotel access road	30/10/21	73.7°	24mm	1112m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 8 Proposed	Looking East from Clayton Hotel access road	30/10/21	73.7°	24mm	1112m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 9 Existing	Looking East from roundabout @ Clonshaugh Rd and R139	30/10/21	73.7°	24mm	1101m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 9 Proposed	Looking East from roundabout @ Clonshaugh Rd and R139	30/10/21	73.7°	24mm	1101m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 10 Existing	Looking East from playing field in Belcamp Park	30/10/21	73.7°	24mm	907m	Canon EOS 5DS

digital dimensions
architectural visualisation

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 10 Proposed	Looking East from playing field in Belcamp Park	30/10/21	73.7°	24mm	907m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 11 Existing	Looking East from R139 at entrance to St Michaels House	30/10/21	73.7°	24mm	305.6m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 11 Proposed	Looking East from R139 at entrance to St Michaels House	30/10/21	73.7°	24mm	305.6m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 12 Existing	Looking East from R139 at entrance to Cara Park	30/10/21	73.7°	24mm	305.6m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 12 Proposed	Looking East from R139 at entrance to Cara Park	30/10/21	73.7°	24mm	305.6m	Canon EOS 5DS

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 13 Existing	Looking North East from R139 at entrance to Northern Close	30/10/21	73.7°	24mm	149.5m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 13 Proposed	Looking North East from R139 at entrance to Northern Close	30/10/21	73.7°	24mm	149.5m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

|< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >|

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 14 Existing	Looking North from Darndale Park	30/10/21	73.7°	24mm	142.5m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 14 Proposed	Looking North from Darndale Park	30/10/21	73.7°	24mm	142.5m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 15 Existing	Looking North from Darndale Park at playground	30/10/21	73.7°	24mm	214m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 15 Proposed	Looking North from Darndale Park at playground	30/10/21	73.7°	24mm	214m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 16 Existing	Looking North from R139	30/10/21	73.7°	24mm	32.3m	Canon EOS 5DS

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 16 Proposed	Looking North from R139	30/10/21	73.7°	24mm	32.3m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 17 Existing	Looking North West from R139	30/10/21	73.7°	24mm	203m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 17 Proposed	Looking North West from R139	30/10/21	73.7°	24mm	203m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 18 Existing	Looking West from Mayne River Ave at Bewleys entrance road	30/10/21	73.7°	24mm	206m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 18 Proposed	Looking West from Mayne River Ave at Bewleys entrance road	30/10/21	73.7°	24mm	206m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 19 Existing	Looking North West from roundabout at Malahide Rd & Priorswood Rd	30/10/21	73.7°	24mm	813m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 19 Proposed	Looking North West from roundabout at Malahide Rd & Priorswood Rd	30/10/21	73.7°	24mm	813m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 20 Existing	Looking North West from near junction of Malahide Rd & Belcamp Lane	30/10/21	73.7°	24mm	524m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 20 Proposed	Looking North West from near junction of Malahide Rd & Belcamp Lane	30/10/21	73.7°	24mm	524m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 21 Existing	Looking West from junction of Malahide Rd & R139	30/10/21	73.7°	24mm	489m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 21 Proposed	Looking West from junction of Malahide Rd & R139	30/10/21	73.7°	24mm	489m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° > |

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 22 Existing	Looking West from junction of Malahide Rd & College ave	30/10/21	73.7°	24mm	31m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 22 Proposed	Looking West from junction of Malahide Rd & College ave	30/10/21	73.7°	24mm	31m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

|< 24mm / 73.7° |< 35mm / 54.4° |< 50mm / 39.6° Lens Information: Focal Length / Field of View 50mm / 39.6° >| 35mm / 54.4° >| 24mm / 73.7° >|

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 23 Existing	Looking West from junction of Malahide Rd & College ave	30/10/21	73.7°	24mm	175m	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 23 Proposed	Looking West from junction of Malahide Rd & College ave	30/10/21	73.7°	24mm	175m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

Blue line indicates oultine of proposed development under seperate application number: F21A/0401

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 23 Proposed	Looking West from junction of Malahide Rd & College ave	30/10/21	73.7°	24mm	175m	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

< 24mm / 73.7° | < 35mm / 54.4° | < 50mm / 39.6° | Lens Information: Focal Length / Field of View | 50mm / 39.6° > | 35mm / 54.4° > | 24mm / 73.7° >

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 24 Existing	Looking North from within site looking towards Belcamp House	30/10/21	73.7°	24mm	N/A	Canon EOS 5DS

digital dimensions
architectural visualisation

Our Ref: 22-010 Belcamp SHD_print

Location	Description	Photography Date	Field of view	35mm equivalent	Distance to site boundary	Camera model
View 24 Proposed	Looking North from within site looking towards Belcamp House	30/10/21	73.7°	24mm	N/A	Canon EOS 5DS

Our Ref: 22-010 Belcamp SHD_print

digital dimensions
architectural visualisation

APPENDIX 12.1: PUBLIC TRANSPORT CAPACITY ASSESSMENT

PUBLIC TRANSPORT CAPACITY ASSESSMENT

BELCAMP SITE, MALAHIDE ROAD, CO DUBLIN.

DERRY O'LEARY
PUBLIC TRANSPORT CONSULTANT

April, 2022

olearyderry@gmail.com

1. Introduction.

Gerard Gannon Properties intend to apply to An Bord Pleanala for planning permission for a strategic housing development (SHD) at Belcamp, Malahide Road, Dublin 17. This report, by Derry O'Leary, Transport Consultant, has been commissioned by Gerard Gannon Properties to provide an overview of the adjacent existing bus network, assess the available spare capacity in the current public transport network and review the implications for the proposed National Transport Authority's BusConnects network in the area. The author, a Civil Engineer, qualified as a Traffic Engineer and has over 40 years experience in both the public and private sectors. He has spent nearly 30 years in both planning and operations in Dublin Bus. This report supplements the Traffic and Transport Assessment (TTA) undertaken by Waterman-Moylan (WM) and the Sustainable Transport Strategy (STS) prepared by SYSTRA on the subject site.

Site Description

The Belcamp lands are located centrally in the Dublin Fringe area, north of the Northern Cross Route, R139, to the east of the IDA lands, and to the west of the Malahide Road (R107). The IDA lands are zoned "High Technology" (HT), to provide for office, research and development and high technology/high technology manufacturing type employment in a high quality built and landscaped environment. The total site area of the subject lands is c.67.2 hectares.

The subject site is bounded to the north and west by agricultural lands, to the south by the R139 Regional Road and to the east by an existing mixed-use development, by Phase 1 of the Belcamp development, which is currently under construction by the Applicant, and by the Malahide Road (R107).

The Mayne River flows from west to east through the site. The northern portion of the subject site is within Fingal County Council's jurisdiction, while the southern portion of the site is within Dublin City Council's jurisdiction, with the Mayne River forming the border between the two Local Authorities.

The proposed development comprises a total of 473 houses, 274 duplexes and 1,780 apartment units in 18 no. blocks, all on a c.67.2 Ha site. All of the proposed houses/duplexes are in the northern portion of the site, within Fingal County Council, and there are 550 apartment units proposed in this portion of the site, with 1,230 apartment units proposed in the southern portion of the site, within the administrative area of Dublin City Council.

Figure 1. Site Location Map (Source: Google Maps).

2. Background to Dublin’s Public Transport Network

2.1 While the customer-facing bus network serving the Greater Dublin Area has been relatively stable in recent years, the organisation of these operations has undergone significant structural change in the last decade or so. The National Transport Authority (NTA), established in 2009, has a wide number of roles in the transport sector. One of these remits is its role as public transport Regulator. Under this relatively new regime, the overall planning of bus and rail services nationwide has moved from the CIE Group of companies to the NTA. Responsibility for the network and individual route designs, frequencies, fares and timetable details, etc. now lies solely with the Regulator. All operators providing services under Public Service Obligation (PSO) or State subvention do so under contract to the NTA. Under this new arrangement even the smallest modification to any bus route or timetable must be agreed with the NTA in advance of implementation. The NTA also approves and allocates licences to commercial bus operators, subject to agreed routes, timetables and conditions. Irish Rail services, including the DART in this instance, also come within the ambit of the NTA.

2.2 In 2015, the NTA commenced a comprehensive review of the efficiency and effectiveness of the Greater Dublin Area’s (GDA) bus network, branded as Bus Connects. In parallel, it also began a Bus Market Opening (BMO) process to open up much of the Irish bus market to competition. These are now briefly outlined below.

3. Bus Market Opening (BMO)

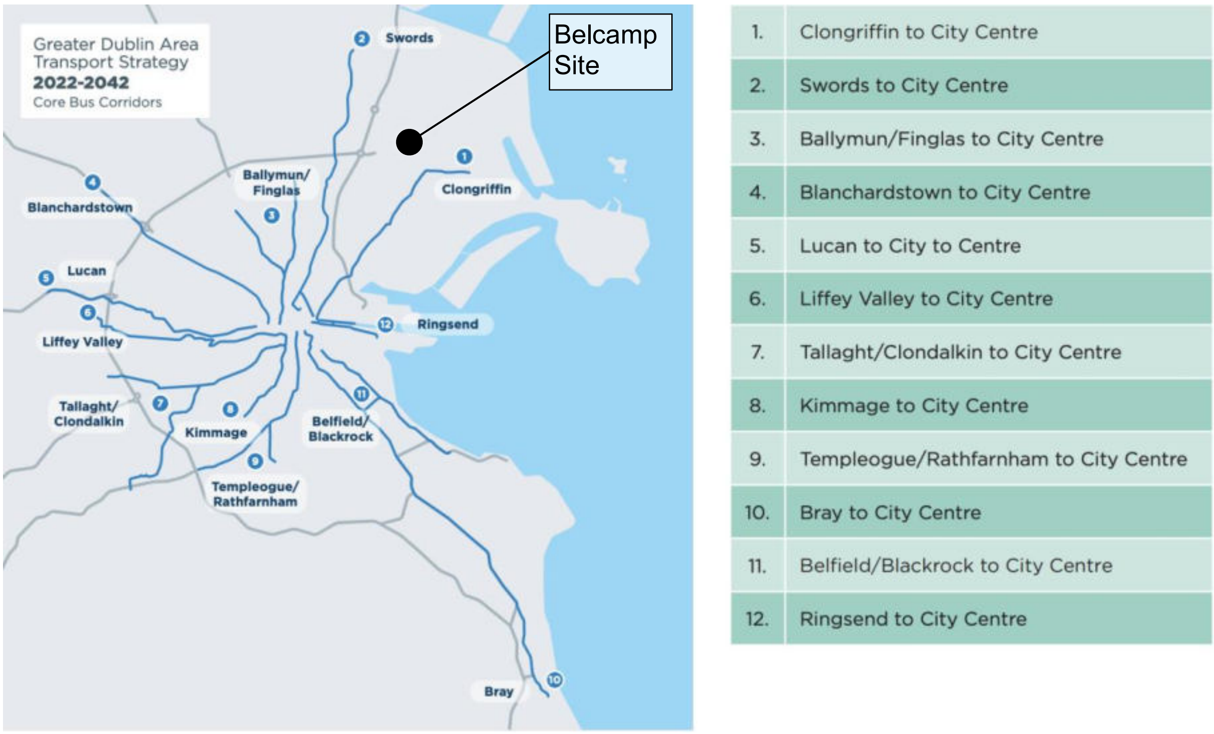
3.1 In order to open the Irish bus market to private sector rivals to the incumbent State-owned operators (Dublin Bus and Bus Eireann) the NTA first tendered a package of orbital bus routes previously operated by Dublin Bus in 2016. The group of 24 orbital routes, and total fleet of 125 buses, represented roughly 10% of the bus market in the Greater Dublin Area (GDA). Following the competitive tendering process, the Go-Ahead Group (a largely UK-based bus and rail operator with large overseas businesses) was selected to operate these routes. The seamless transfer of routes, in stages, from Dublin Bus to Go-Ahead Ireland (GAI) took place over a 12-month period in 2018/2019. The switch was barely noticed by the general public and passengers alike, as the new operations were introduced under the NTA's Transport for Ireland (TFI) brand. At this point in time all of the key PSO routes operating on the Malahide Road near the subject site are radial in nature and therefore are still operated by Dublin Bus.

3.2 All PSO operators, whether commercially or State-owned, operate bus services under contract to the NTA and must meet a set of key performance indicators (KPIs) covering reliability, timekeeping and vehicle maintenance. Similar standards are expected of all contracted operators and failure to meet the targets will result in fines or contract cessation. Both the performance standards expected of contractors and the level of fines exacted for not meeting those standards are in the public domain.

3.3 The NTA entirely owns the current fleet deployed by GAI to operate its routes in the GDA. It appears that, over time, the entire publicly-owned public transport fleet will be owned by the NTA as the fleet is renewed and the Authority obtains the capital funding to buy and replace buses for use in the PSO networks across Ireland. The next batch of buses ordered by the NTA for the Dublin urban market are fully-electric traction. The delivery of the first of these EV buses is expected in 2024, commencing operation in 2025.

4. Bus Connects Project Overview.

4.1 This comprehensive re-design of the urban bus network in the Greater Dublin Area (GDA) was commenced by the NTA in 2015. In tandem with the service re-designs, the bus route alignments, including the successful Malahide QBC, under the NTA proposals, will be upgraded to radically enhance bus priority measures. This capital investment on the QBC alignment is required to further protect the enhanced operation from the adverse impacts on reliability caused by traffic congestion and improve average bus speeds significantly. These Core Bus Corridors (CBCs), along which the high-frequent "Spine routes" will run, and the revised routes themselves have been through a series of extensive consultation phases with the general public and key stakeholders. Local Authorities have been directly involved in both the bus route and CBC design process. The route network consultation process, which concluded in 2020, modified the proposals following the review of thousands of submissions by members of the public and key stakeholders. The final network has now been agreed.



1.	Clongriffin to City Centre
2.	Swords to City Centre
3.	Ballymun/Finglas to City Centre
4.	Blanchardstown to City Centre
5.	Lucan to City to Centre
6.	Liffey Valley to City Centre
7.	Tallaght/Clondalkin to City Centre
8.	Kimmage to City Centre
9.	Templeogue/Rathfarnham to City Centre
10.	Bray to City Centre
11.	Belfield/Blackrock to City Centre
12.	Ringsend to City Centre

Figure 2. NTA's Core Bus Corridors (CBCs). The Malahide Road is on corridor 1 (Clongriffin to City Centre).

4.2 Phased implementation of new Spine routes has already started. To date, only two of the phases required to modify the bus network in the Greater Dublin Area have been introduced. The C-Spine and H-Spine changes have been introduced in parts of the west and north suburbs of Dublin. While new route H1 of H-Spine routes now operates relatively close to the Gerard Gannon Properties site under review here it is still too far away to have a significant impact. All the existing routes in the Belcamp area are discussed in detail in section 5.

4.3 Further Bus Connects phases, including routes of more direct relevance here, have been designed and planned but will take a number of years to implement. The whole network of services, though somewhat delayed to date, is expected to be implemented in phases by 2024. The future BusConnects bus network serving the wider Belcamp area is addressed in section 7. The Core Bus Corridors, effectively QBC upgrades, will shortly be the subject of a formal planning application.

5. Existing Public Transport Network Serving the Belcamp Site.

5.1 The Belcamp site is well-located immediately adjacent to the very successful Malahide Road Quality Bus Corridor (QBC) to the east. The key bus routes in the area are identified in Table 1 below, together with their advertised timetabled frequencies.

Route	Origin	Destination	Peak Frequency (mins)
15	Clongriffin	Ballycullen	10
27	Clare Hall	Jobstown	10
42	Portmarnock	City Centre	20
43	Bray Station	Ballymun (IKEA)	20
27X	Clare Hall	UCD Belfield	2 trips only

Table 1. Routes on Malahide Road, Clare Hall. Southbound AM Peak.

The Malahide Road QBC is one of the original Quality Bus Corridors in Dublin. It is a major axis for a wide variety of bus routes that serve the north eastern suburbs of Dublin. It has a combination of high bus flows, strong bus patronage and significant peak traffic congestion, even if the level of each has diminished somewhat post Covid-19. Two high frequency cross-city routes, 15 and 27, dominate bus flows here as Table 1 above and survey data in section 5 below show. They both join the Malahide Road at Clare Hall. Route 15 commences at Clongriffin Station and offers an existing link to the DART service. Route 15 is one of the few routes to operate a 24-hour bus service. The two other routes with significant bus patronage, routes 42 and 43, pass immediately to the east of the site, on the Malahide Road (R107). The combined strength of these four routes is reflected in the surveys. They are the backbone of the bus service along the entire length of this QBC. The peak bus service from the area is supplemented, according to the timetable, by two peak buses on express route 27X which terminates in UCD, Belfield.

5.2 The future occupants of the Belcamp site, as of now, would have the attractive option of boarding routes 42 and 43 at stop 1217 (Malahide Road, Balgriffin Road) close to their residences adjacent to the subject site. But many, if not most, will likely board buses at stop 4563 (Malahide Road, Clare Hall) with the existing route configuration. The latter stop opens up significantly more options for commuters. The basis for this assertion is addressed in section 5.3 below. Both stops 1217 and 4563 are within acceptable walking distance of the site. Stop 1217, the closest southbound to the development, is only 75m from the planned site entrance.

The Clare Hall stop, while almost 740m away from the site entrance, has roughly three times the number of current bus services available to future residents at this location which shortens the perceived walking distance.

5.3 In modelling the behaviour of travellers, whether by car, bus or rail, traffic engineers and transport economists use the concept of "generalised cost" which uses the "value of time" in broadly determining modal split (or between competing routes). The modellers break down the components of alternative possible trips into their constituent parts. Simplistically, in this example, it breaks down the bus trip into four basic time components. In this instance,

- Firstly, the walk time to the target bus stop(s).
- Secondly, the wait time for the bus.
- Thirdly, the duration of the bus journey itself and,
- Finally, the walk time to the work or school destination.

The impacts of fares, etc. are ignored in this brief outline. Each element of the bus trip is assigned different weightings, depending on their relative attractiveness.

While there is some debate over the values of these weightings, extensive research has shown that travellers generally dislike both the walking and waiting elements of the journey more than the in-vehicle journey time. On this basis, the walk element is usually assigned a value greater than 1. The weighting assigned to waiting for buses typically has a higher value, normally 2 or greater. This reflects the degree of relative discomfort or uncertainty associated with the unknown arrival time of the bus. The weighting value of the actual bus trip itself is closer to 1 if it has a very predictable and repetitive journey time. The value of any equivalent rail weightings for both the waiting component and journey time are typically somewhat lower due to their greater general predictability, though not directly relevant here.

5.4 One outcome of this modelling based on behavioural research conducted over decades is that the trade-offs that travellers use in determining what mode they use can be assessed. In practice this suggests that the likelihood of city-bound commuters from the Belcamp area walking to the key Clare Hall stop is extremely high for one outstanding reason. Much higher bus frequencies are available at this stop towards Dublin city centre. The strong frequency results in a much lower weighting for the "wait element" of the journey. At the same time, the good bus speeds lower the "journey time" weightings. Collectively they reduce or overcome any possible negatives associated with longer walks at the start of the journey. The outcome here is a “generalised cost” of travel that is much reduced by a combination of high bus frequency and fast, predictable QBC bus speeds. If a future bus route were to commence within the new development, the “best case scenario”, then generalised cost would be materially reduced still further. The relative benefits of bus travel on QBC corridors is also enhanced if high levels of congestion are present, making travel by car less attractive, and increasing public transports’ modal share. In the long term, the planned NTA upgrade to the QBC to CBC standard (see 4.1 above) would further enhance average bus speeds, thereby again lowering the “cost” of travel by bus.

6. Public Transport Capacity Assessment.

6.1 The purpose of this analysis is to determine whether or not the demand for public transport generated by further developing the Belcamp site will put the existing bus services under undue pressure. Surveys of bus patronage have been undertaken to demonstrate that the additional demand will not burden the existing levels of public transport services.

6.2 The demand profile for public transport services, like road traffic, is quite seasonal in nature.

- Demand for bus and rail services, in general, is materially lower in the Summer and school holiday periods.

- Demand tends to be somewhat higher in the late Autumn and in the run up to the busy Christmas holiday. Surveying in the none-holiday weeks in the opening four months of the year, and early Autumn, represent a reliable indication of base-level pre-development expressed demand for transport.

- Demand also varies by day of the week, with traffic demand generally lower on Mondays and Fridays, with some exceptions. Public transport usage on Saturdays and Sundays (in particular) are materially lower than mid-week demand.

- Demand for travel varies throughout the standard weekday but morning peak- hour levels are shorter but higher than the corresponding evening peak flows.

6.3 In determining whether spare capacity is available to meet increasing demand from any development site it is best to undertake surveys and test the midweek morning peaks prior to the Summer period when schools are open. This advice was strictly followed in the surveys undertaken for this report.

Bus Survey on Malahide QBC

6.4 As we have seen above in section 5.2, the walk distance to the closest city bound bus stop (1217) is 75m or only a 1 minute walk from the site entrance on the Malahide Road. However, only current routes 42 and 43 pass this point in the bus network. While stop 4563 at Clare Hall is somewhat further away, roughly 740m or 9 minutes walk, it made sense to survey the latter as one captures a wide variety of city-bound buses at this point, including the routes cited above.

Surveys of existing bus usage were undertaken on Thursday, 7th April, 2022 between 06.45 and 08.45 am to establish the current level of bus patronage at stop 4563. These have been undertaken at a suitably representative time of the year, as identified in 6.2 above. Details of the survey are now outlined.

6.5 Bus capacity for the purposes of this analysis is taken, conservatively, as the seated capacity only, which, at 67 seats, understates the ultimate true capacity of buses by roughly 20%. Table 2 below shows the passenger demand profile by time band of the survey data for the morning peak in question.

Timeband	Bus Numbers	Passengers	Passengers/Bus
06.45 - 07.00	4	83	21
07.01 - 07.15	5	75	15
07.16 - 07.30	5	125	25
07.31 - 07.45	4	70	18
07.46 - 08.00	7	201	29
08.01 - 08.15	6	181	30
08.16 - 08.30	4	160	40
08.31 - 08.45	6	165	28
Total	**41**	**1,060**	**26**

Table 2. Malahide Road at Clare Hall (STOP 4563).

This summary in Table 2 of bus passengers per 15 minute time band indicates that the busiest period at stop 4563 (Clare Hall), occurs between 07.45 and 08.15. but the peak is not very pronounced. Note the increase in buses during these time bands.

Demand remains relatively strong up to the end of the survey period at 08.45. After this time scheduled bus numbers fall away appreciably. In summary, the survey showed that

- In excess of 1,000 passengers in total were on buses at this point over the survey period. The demand was well spread over the survey period.
- A total of 41 buses scheduled to stop at this stop were recorded.

- The bus appeared, in their pattern of arrival, to operate largely to schedule throughout the survey period
- The average number of passengers per bus was quite low at 26 over the entire period, peaking at just 40 in the 08.16 - 08.30 time band. It must be noted that route 27 just starts, literally, around the corner from stop 4563, two stops earlier, on Clare Hall Avenue (R135) at stop 4595 (Clare Hall Avenue, Clare Hall) and low passenger loading in the initial stops served to bring down the overall bus average.
- The regularity of the service was good, with buses evenly spread over the survey period and passengers were comfortably carried to their destinations.
- Standing customers on the buses were observed on only two buses at the survey location.
- On a number of occasions buses passed the stop, when not hailed, when another bus was loading. The routes are nearly identical in nature from this stop to the city centre, except for an early deviation into Darndale on route 27.
- Schoolchildren boarding at this stop was a feature of the survey at this stop location.

6.6 The busiest period, in terms of passengers loadings on departing buses from this stop, only exceeded 200 passengers and occurred between 07.46 and 08.00. Buses leaving this stop in this time band still have plenty of spare capacity with 29 passengers per bus (see table 2) and will have delivered their customers to city centre destinations well in advance of any 09.00 start. Table 3 below presents the same survey data, but on a route basis. On the assumption of 67 seats per double deck bus, this table identifies the actual spare capacity by route.

Route Number	Bus Numbers	Passengers	Passengers/Bus	Spare Capacity %
15	14	584	42	37
27	12	98	8	88
42	6	159	27	60
43	6	205	34	49
27X	3	14	5	93
Total	**41**	**1,060**	**26**	**61**

Table 3. Passenger Numbers and Spare Capacity by Route (STOP 4563, Clare Hall)

There are a total of 5 routes that passengers can board at this stop, as indicated earlier in Table 1, and seen in Table 3 immediately above. In addition to routes 42 and 43 passing immediately adjacent to the Belcamp site, passengers from here that choose to walk to this stop at Clare Hall benefit additionally from two major Dublin Bus routes, services 15 and 27. The latter route is supplemented by the express route 27X that operates to UCD. The two large routes each have a daytime frequency of a bus every 10 minutes. Route 15 is one of the few city bus routes to operate on a 24-hour basis. It has a bus every 30 minutes between midnight and 06.00 hours. Passengers on route 27 (and 27X) would be expected to be low at this point as the route has only just commenced two stops earlier on Clare Hall Avenue. The data bear this out.

6.7 The impact of Covid-19 is very visible to anyone familiar with this part of the bus network with volumes below “normal” levels experienced before March 2020. This is generally true of the whole Dublin bus network. The Malahide Road QBC is one of the primary bus axes in the city. It has continued to perform well since its introductory launch as the original QBC in the late 1990’s. The near-continuity of southbound bus lanes from beyond the Clare Hall junction to Amien Street and across the Liffey insulates bus operations against normally high levels of congestion. From Table 3 it is obvious that there are abnormal levels of spare capacity currently here and elsewhere along the Malahide Road QBC. The average spare capacity of routes serving the city over the survey period from Table 3 above exceeds 60%. This is admittedly driven higher by the very low patronage (in single figures) on route 27 at this point. Route 15, the other key route, has materially fewer seats available to passengers at this point with an average 42 passengers per bus and spare (seated) capacity of 37% from Table 3. A few route 15 buses were full at the Clare Hall stop during the busiest periods. Passenger volumes on this route are quite high, given that the route has only commenced at Clongriffin Station. Routes 15 and 27 (together with the 27X to UCD) operate cross-city and draw extra patronage on this basis as they open up additional destinations for their customers. While only two route 27X peak buses are advertised (as indicated in Table 1), three were surveyed at this stop. From a bus operator’s perspective many of these buses would be viewed as under-utilised at this point in the peak but it must be recognised that they still have to operate over the bulk of the QBC. While route 15 is more direct in its alignment, route 27 operates along the entire QBC after the Greencastle Road junction having diverted off the QBC to serve the Darndale area.

6.8 There was little evidence of any bus passenger failing to board a bus because it was full. While some passengers were observed leaving specific buses pass by in order to board other buses following behind, this practice more likely relates to their ultimate final destination (not all routes suit them) than any lack of capacity. Routes 42 and 43 do not operate cross-city while the remainder of the services do. The level of information now available to potential bus passengers, due to travel Apps and the increasingly reliable real-time passenger information (RTPI) units at the surveyed stop, facilitate active trip management by commuters and increases satisfaction and customer confidence in the services generally. Some passengers were seen alighting one bus and then boarding another shortly afterwards. Interchange of this nature shows a high degree of confidence in the bus service.

The latest ticketing options available to Leap card holders do facilitate and encourage inter-bus and intermodal interchange.

6.9 Prior to Covid-19, a certain level of overcrowding along the busiest sections of the Malahide Road QBC was commonplace in peak periods. But the high frequency nature of the service here meant that few regular bus passengers either anticipated or experienced material delays. This was because any short-term overcrowding in the form of queues at stops, lasting a minute or two, were quickly eliminated by the frequency of the buses. Regular bus users on most QBCs are not overly concerned given that more buses follow on relatively quickly, and are “visible” on the RTPI screens. The significantly higher levels of spare capacity on route 27 at this point offers additional certainty of securing a seat for potential passengers from the subject site. The average spare capacity of route 27 is 88%. It is even higher for its sister route 27X but both, it must be noted again, have only just commenced operation prior to the survey stop. Additional bus surveys undertaken by Waterman Moylan, at stops 1217, closest to the subject site (on the R107), and 4596 on Clare Hall Avenue, served, as expected, to confirm the data from Clare Hall stop 4563 in terms of the high levels of spare capacity.

6.10 Buses in the opposite, northbound, direction also have solid frequencies (such as on the key routes identified here). The equivalent northbound bus services have much lower patronage levels, except in the evening peak. The evening peak around Dublin is relatively well spread as most returning schoolchildren head home well ahead of the commuter peak. The morning peak operations are where loading problems will first manifest themselves.

Spare Capacity after Generated Trips

6.11 In assessing the impact of estimated generated trips from the proposed Belcamp SHD development on the public transport network this report has drawn on the work done by both Waterman-Moylan in their Transport and Travel Assessment (TTA) and by Systra in their modelling work for the South Fingal Transport Study (SFTS) and the Sustainable Transport Strategy (STS) for the Belcamp site. The detailed TRICS assessment and modal share analysis, when combined, suggests that

- An AM Peak trip rate of 0.606 per unit from TRICS represents a reasonable expectation
- 16% of Belcamp residents will likely use public transport (buses) to journey to work, school and college in the AM peak hour (see section 6.2, Table 5 and 6.3 of the Belcamp TTA for details)
- This modal split for buses is in respect of all distance bands but that a higher figure would apply for Dublin City bound commuters.

6.12 For the purpose of this broad bus capacity analysis it is assumed that Phase 1, which includes the first 1,504 units are to be completed and occupied by 2028 and that Belcamp's full build out of 2,527 units, is completed by 2032. Table 4 below summarises the impact on current bus patronage of the modal split assumptions when combined with the timelines above. In the April 2022 survey the peak hour in terms of bus patronage was between 07.45 and 08.45, as seen in Table 2 above. In this hour a total of 707 passengers boarded at the Clare Hall stop (4563).

Year	Additional Units	Generated Trips (TRICS of 0.606)	Generated Bus Trips (16%)	Peak Hour BusTrips	Increase in Peak Hour Trips %
2022	**-**	-		707	-
2028	**1504**	911	146	853	20.7
2032	**1023**	620	99	952	34.7

Table 4. Impact of generated trips on current peak volumes.

In Table 4 the surveyed AM peak hour passenger numbers on buses at Clare Hall are increased incrementally with the anticipated generated trips using modal split assumptions based on Systra's modelling work. The generated AM peak hour trips for Phase 1 of Belcamp up to 2028 results in 146 additional bus passengers. While this represents a 20.7% increase on current peak hour surveyed passengers of 707, the existing average level of spare capacity at 61% (from Table 3) is not challenged. Even in the busiest 15-minute period (the peak within the peak) the average passengers per bus did not exceed 40. This equates to spare seated capacity of 40% for a 67-seater bus. With the full build out of the Belcamp SHD scheme by 2032 the level of generated trips attributed to buses increases by nearly 35% with an additional 99 passengers. The current level of spare seated capacity would cater for this increase even during the busiest period in the AM peak hour. While other scheme build-outs will occur over this period, the 20% extra capacity associated with a full bus, including standees, is also available to commuters. The NTA, under its Measure Bus5 process, will also continue to monitor and enhance bus services as required to meet demand (see 7.4 below).

6.13 The analysis above demonstrates that there are significant levels of spare capacity on the current bus network in the immediate area of the subject site as shown by the bus stop survey undertaken for this report. It should be noted that the public transport modal split volumes in Table 4 above are based on the current network of bus services. As can be seen in section 7 below a whole series of new opportunities will soon arise for public transport users to access many other areas of the city network. The BusConnects project, as it directly applies to the Belcamp area, is now described.

7. Bus Connects Network in Belcamp area

7.1 Figure 2 below shows the proposed Bus Connects network for the subject area. It is extracted from the NTA's most recently revised "Big Picture Network" following rounds of public consultation and revision. The NTA proposals, in summary, are for the "D-Spine" with an upgraded QBC to Core Bus Corridor (CBC) status with even higher levels of bus priority.

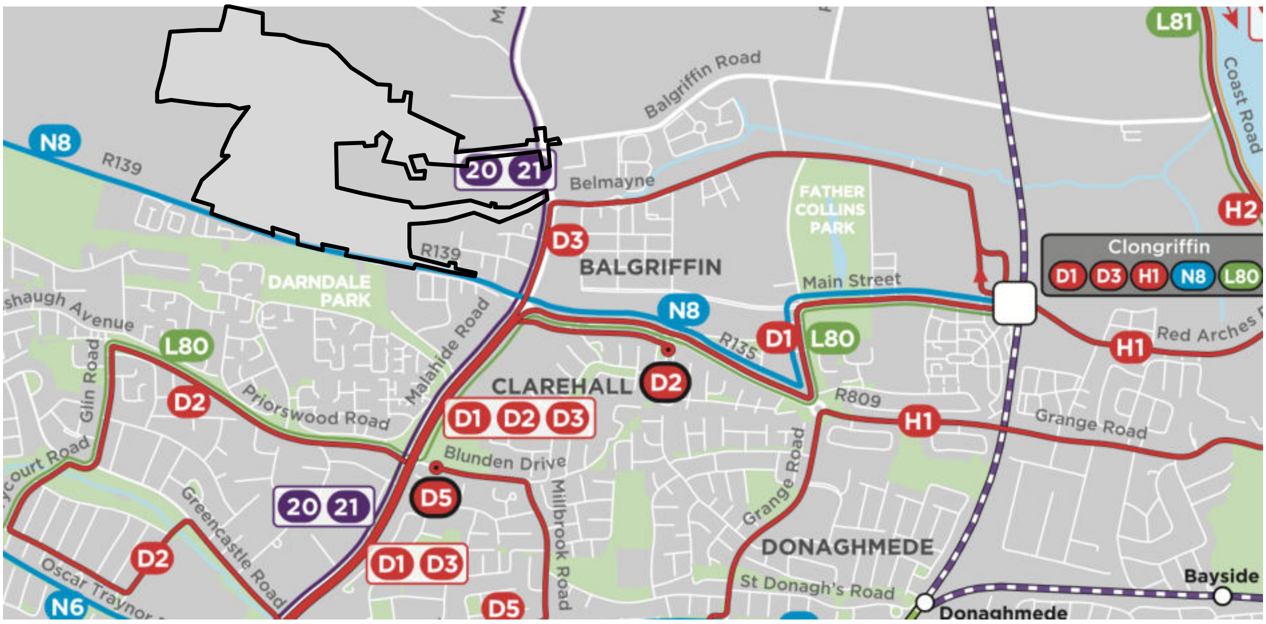


Figure 3. Extract from the NTA's Big Picture Network (latest version).

7.2 The NTA proposals for this area are for some of the key "D-Spine" routes running on an upgraded QBC to Core Bus Corridor (CBC) status, with even higher levels of bus priority and significantly faster average bus speeds. The route proposals together with the latest NTA Bus Connects Frequency Table that accompany the route network shows three major routes forming the backbone of this key cross-city spine of services supplemented by a series of other radial, orbital and local routes.

The comparison of existing versus proposed routes is best summarised in Table 5 below.

Existing Route	Current Frequency (mins)	Bus Connects Replacement	Frequency (mins)
15	10	D1	15
27	10	D2	15
-		D3	15
42	20	20	30
43	20	21	30
27X	2/3 trips only	-	-
-		**N8**	30
-		L80	20

Table 5. Comparison of existing and proposed Bus Connects routes for Belcamp/Clare Hall area.

The highlights in Table 5 are the addition of two new routes into the bus network. Route N8, an entirely new north city orbital that is currently planned to operate westwards from Clongriffin Station, along the adjacent R139 via Dublin Airport to Blanchardstown Shopping Centre, will plug a significant existing gap in the northern orbital bus network. Route L80, a local route also providing orbital connections, via Beaumont Hospital, to DCU is also a welcome development and opens up novel network connections for this area. However, in keeping with the Bus Connects masterplan elsewhere in Dublin, the “Spine routes" dominate the level of service here.

- **The D1 Spine route,** from Clongriffin Station, via the Malahide Road to the City Centre and west along the Crumlin Road to Grange Castle, effectively replicates the northern section of existing route 15.
- **The D2 Spine route,** from the Clare Hall Avenue (adjacent to Clare Hall) via the Malahide Road to the City Centre and Citywest mirrors virtually all of the existing 27 route.
- **The D3 Spine route,** also operates from Clongriffin Station (but on a different alignment to D1 in the Clongriffin SDZ area), via the Malahide Road to the City Centre and west along the Crumlin Road to Clondalkin and again overlaps much of the northern section of existing route 15.
- **Route 20,** from Malahide via Kinsealy to the City Centre, is a radial route and essentially a direct replacement for existing route 42
- **Route 21,** also a radial service, from Swords Business Park via Kinsealy to the City Centre replicates the routing of existing route 43.

- The proposed **N8 is a northern orbital route** and represents, arguably, BusConnects' most significant addition to the public transport network. It is the most northern of the northern orbital group N2, N4, N6 and N8. It is unusual in being a completely new route, operating along much of the northern boundary of the city. It will run from the DART station in Clongriffin, via Dublin Airport, to Blanchardstown Shopping Centre. It is of particular interest to future residents of the subject site. The precise alignment of route N8 in the area of the Belcamp is discussed further below.
- **Local route L80** also represents a departure from the existing bus network and operates diagonally in a south western direction across much of the city's northern suburbs with valuable links to Beaumont Hospital and DCU.

7.3 The key design feature of "Spine routes" in the Bus Connects project is that they generally begin in specific, discreet, suburban areas but quickly merge to form groups along each CBC. The combined frequency of these routes is very strong, post merging. Unusually, in this instance there is a degree of overlap between routes D1 and D2 prior to merging on the QBC/CBC. The former is essentially a longer version of the latter, in the same way that route 27 starts partly along route 15. The planned frequency for each of these three "D-Spine" routes is a bus every 15 minutes each weekday, going to every 20 minutes for much of the weekend. The combined, 5-minute, frequency of routes D1, D2 and D3 from the Clare Hall stop surveyed mirrors the combined frequencies of current routes 15 and 27. (These routes, in turn, merge with the other two "D-Spine" routes D4 and D5 at the Artane roundabout but the impact of D4 and D5 on this review can be set aside.) While the replacement for routes 42 and 43 in BusConnects show a reduced peak frequency this must be seen in the light of the proposed alignment for route D3. In the stretch of Malahide Road immediately east of the site the proposed presence of route D3, when combined with new routes 20 and 21, will represent a small increase on the observed frequency of buses passing bus stop 1217.

7.4 In many respects, the resultant Bus Connects network for the Belcamp site can be viewed as almost a direct replacement of the existing **radial** bus network. The design permits an easy ramp up of services, if required, through increased D-Spine frequencies in the first instance. The modal split objectives of the NTA envisage such changes in time as demand increases. Any examination of the annual cordon count in Dublin - the annual traffic survey last undertaken in 2019 by the key transport agencies - reveals that public transport's share of peak traffic passing the 32 cordon points has trended upwards significantly in the last two decades while the private car share has fallen correspondingly. A combination of both transport and climate policy will continue to drive public transport's share higher. The NTA's Greater Dublin Area Strategy 2022-2042 clearly indicates that "demand for bus services in 2042 would require routes additional to those set out in the network review" (Bus Connects). It proposes that "periodic reviews will be undertaken during the period of the Transport Strategy to evaluate the impacts of changing development and transport patterns, and to implement appropriate additions or adjustments to the overall bus system to accommodate the changing arrangements". This forms the basis for what is termed "Measure Bus5" to continually monitor the bus network and enhance or amend it accordingly. The BusConnects project, now underway, together with the assurances of Measure Bus5, when combined with the enhanced QBCs or CBCs as they will now be called represent as good a guarantee of high quality radial bus services to Dublin as anyone could expect.

7.5 The future **orbital** bus network in the Belcamp area is potentially even more exciting. This derives from a variety of sources. Firstly, the new routes themselves. While the N8 route will, rightly, grab many of the orbital headlines when introduced, the proposed L80 (or Local) service is essentially an orbital route in all but name. It will serve key markets like Beaumont Hospital and DCU and create strong linkage to other areas. Secondly, the N8 route offers the prospect of direct access to and through the subject site. While the current planned east/west alignment of this route envisages the N8 running along Clare Hall Avenue and then R139 south of the Belcamp site, discussions are already underway with the NTA with a view to diverting this route directly along much of the East West Link Road, through the subject site, before exiting via a proposed bus gate back to the R139 (in the absence of the completion of the full East West Link Road envisaged in the Systra SFTS). See Figure 3 below.

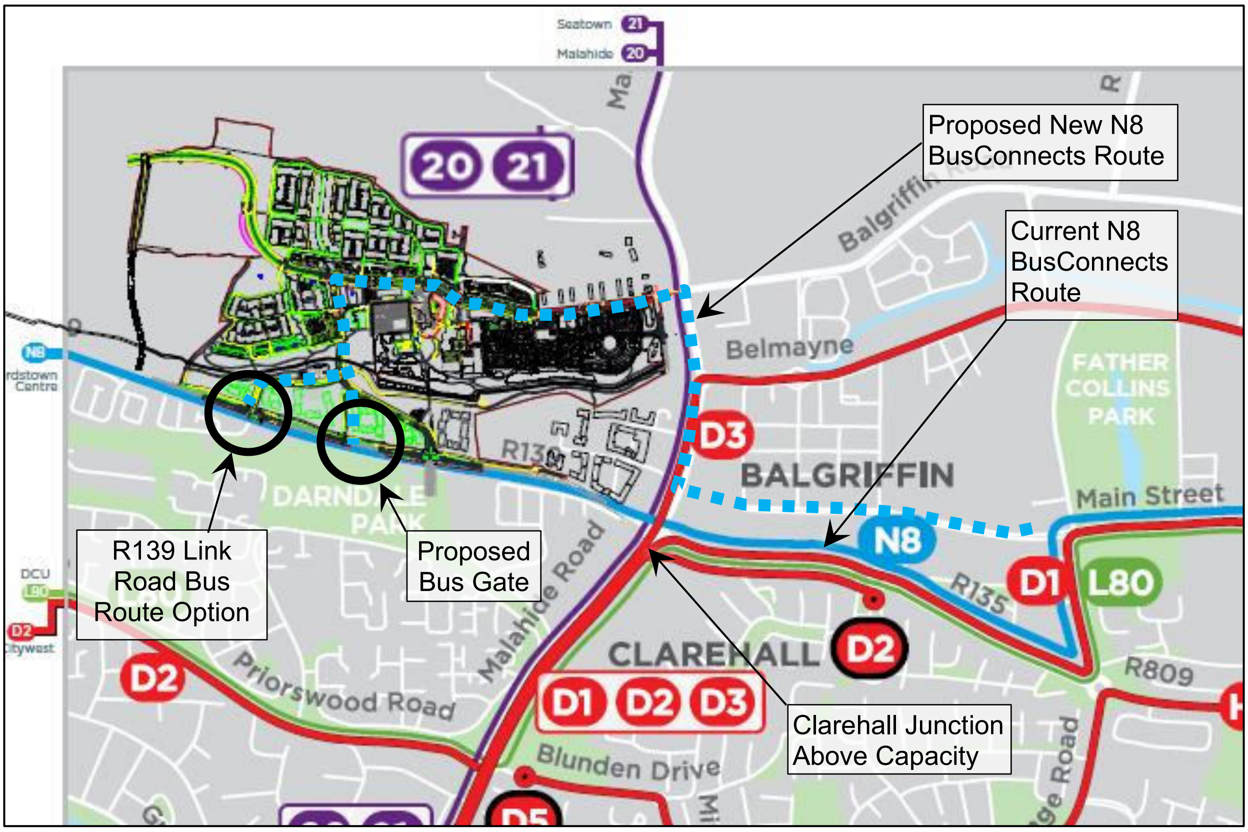


Figure 4. Scheme layout on BusConnects plans. Linkage to R139 includes a bus gate for the N8 route.

The interim arrangement to aid access to the scheme, with an exit to/from the R139 via a dedicated bus-gate, for route N8 is valuable to residents of Belcamp, in the medium term it is not unreasonable to assume that the entire length of route N8 westwards from its Clongriffin terminus to Stockhole Lane will follow via Clongriffin Main St, Belmayne Main St and the bus gate proposed by Dublin City Council for the junction with the R107 to the East West Link Road in the Belcamp SHD scheme. In this way the route will directly serve high density residential areas, have high levels of bus priority throughout, in both directions, and be protected from local traffic congestion. Thirdly, the attraction that such a strong, efficient bus link to the enhanced DART+ frequencies at Clongriffin Station would represent are clear for all to see. Clongriffin, in the BusConnects project, becomes a major transport hub of significance to the entire area. Finally, it is easy to envisage the need for materially higher frequencies on the N8 than the 30 minute frequency currently proposed. Most BusConnects orbital routes of significance have better frequencies, with buses every 10 or 15 minutes throughout the day the norm for most northern (e.g N4, N6) and southern (S2, S4, S6) orbital routes (as outlined in the NTA's BusConnects Frequency Tables). While route N8 will likely attain that type of frequency in time, in the interim it is conceivable that the Belcamp development (and other interested parties in the area) could financially support enhanced frequencies on the N8 from its commencement between the subject site and Clongriffin, if a mechanism for such an arrangement could be agreed with the NTA. The basis for financial contributions need not be unduly complicated.

The strong case for the N8 argued above has been done without even taking into account the enormous employment opportunities that direct linkage with Dublin Airport and beyond open up on route N8 for future residents of the Belcamp area, nor the employment opportunities within the IDA lands, to the west of the subject site, which are zoned "High Technology" (HT), "to provide for office, research and development and high technology/high technology manufacturing type employment in a high quality built and landscaped environment". The combined impact of both radial route upgrades and the new orbital routes suggest that the modal split estimates for public transport departing the Belcamp site in the AM peak will, in practice, be revised upwards in the course of time.

7.6 As identified earlier in 7.2 and 7.4, the introduction of the D-Spine routes largely replicate the current network of routes. Equally, we have also seen from Table 3 above the current very low level of patronage on routes 27 and 27X. The NTA current proposal is to commence route D2 from stop 4595, precisely where route 27 now operates from, a short distance east of the Clare Hall junction on the R135. Looking at the detailed design of the Belcamp SHD scheme with its bus priority measures, quality bus stop infrastructure and industry standard turning facilities for buses there is a very strong case to be made to the NTA seeking an alteration to route D2 that sees it commencing its radial journey south from the heart of the Belcamp SHD development. If the proposed development proceeds as planned the NTA would likely agree to the proposal to amend future route D2, given the potential demand from the scheme and the presence of route D1 already on the R135.

The marginally longer D2 would be more than compensated for with the anticipated increase in patronage.

This will encourage early usage of buses by future residents of the development (reducing car ownership in the process) and make for a better allocation of bus resources for the area as a whole. As with the new N8, every effort should be made to <u>improve direct access</u> to the BusConnects network thereby reducing key elements of the “generalised cost” equation, increasing public transport’s modal share and further achieving key climate goals.

8. Conclusions and Recommendations

This assessment of the existing bus network, the spare capacity currently on the network and the review of the proposed BusConnects routings leads to the following key conclusions and recommendations.

Conclusions

1. The Belcamp SHD site is well positioned to both the existing and the proposed, enhanced, Bus Connects and DART+ public transport network.
2. There are significant levels of spare capacity on the current bus network in the immediate area of the subject site, as shown by the bus stop surveys undertaken for this report.
3. The detailed layout of the SHD scheme contains key infrastructure of immense benefit to buses, both in the short and long term.
4. The NTA's BusConnects project proposals include attractive new orbital and radial routes of direct benefit to the development.

Recommendations

1. To increase the public transport mode share of the scheme the Developer should continue the efforts to re-route the new orbital N8 service through the site to the maximum extent possible from inception.
2. There is a case to be made for supporting enhanced frequencies on the new N8 to/from the subject site and Clongriffin Station in its early years.
3. The various parties, public and private, controlling the east/west alignment north of the R139/R135 axis of route N8 must come together to expedite use of this alignment to their mutual benefit.
4. The NTA should be approached with a view to commencing the D2-Spine route from within the development at the earliest opportunity to enhance the route's attractiveness and increase buses' modal share.

APPENDIX 12.2: SYSTRA TRAFFIC FLOWS

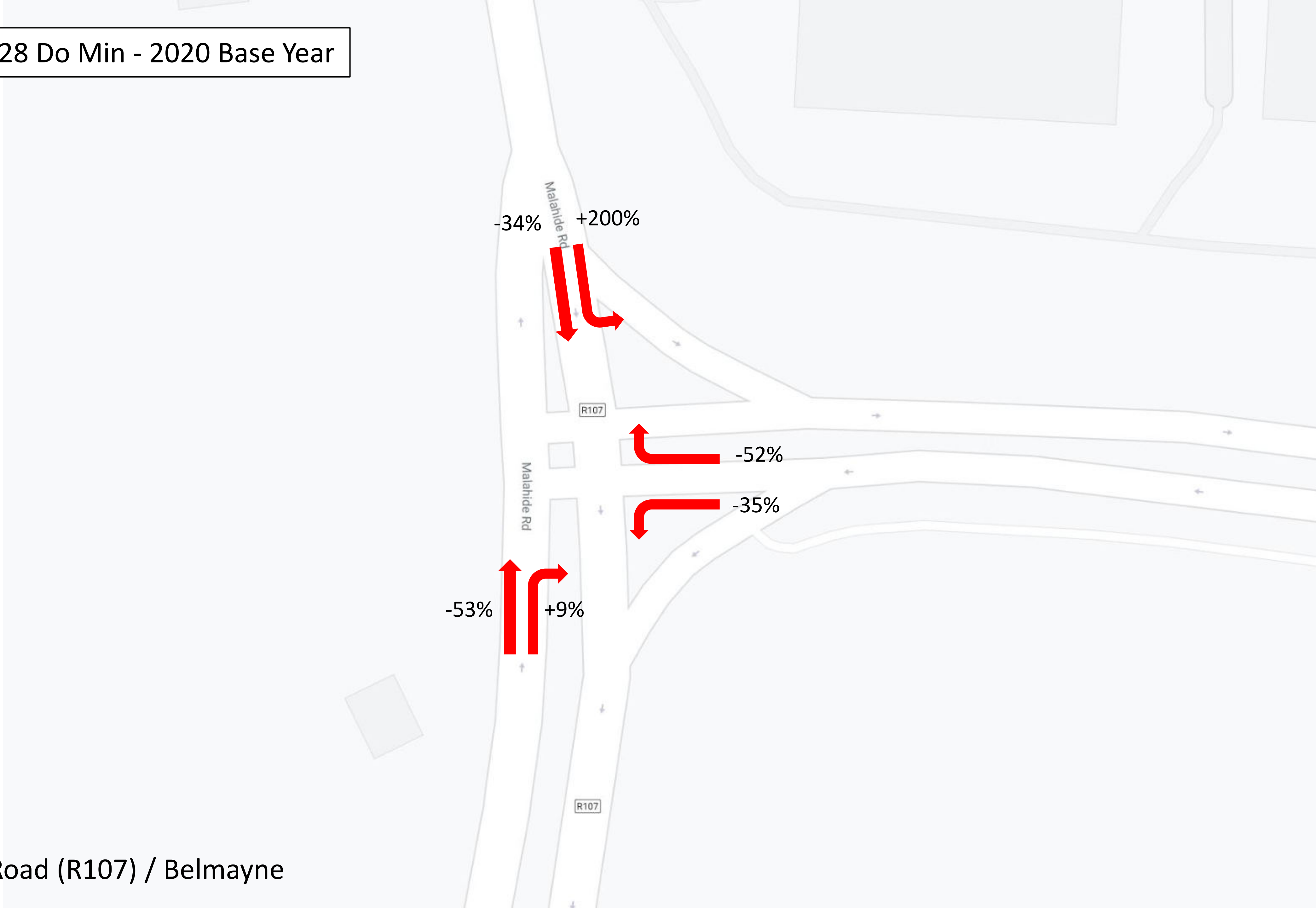
AM

2028 Do Min - 2020 Base Year

Malahide Road (R107) / Balgriffin Cottages

2028 Do Min - 2020 Base Year

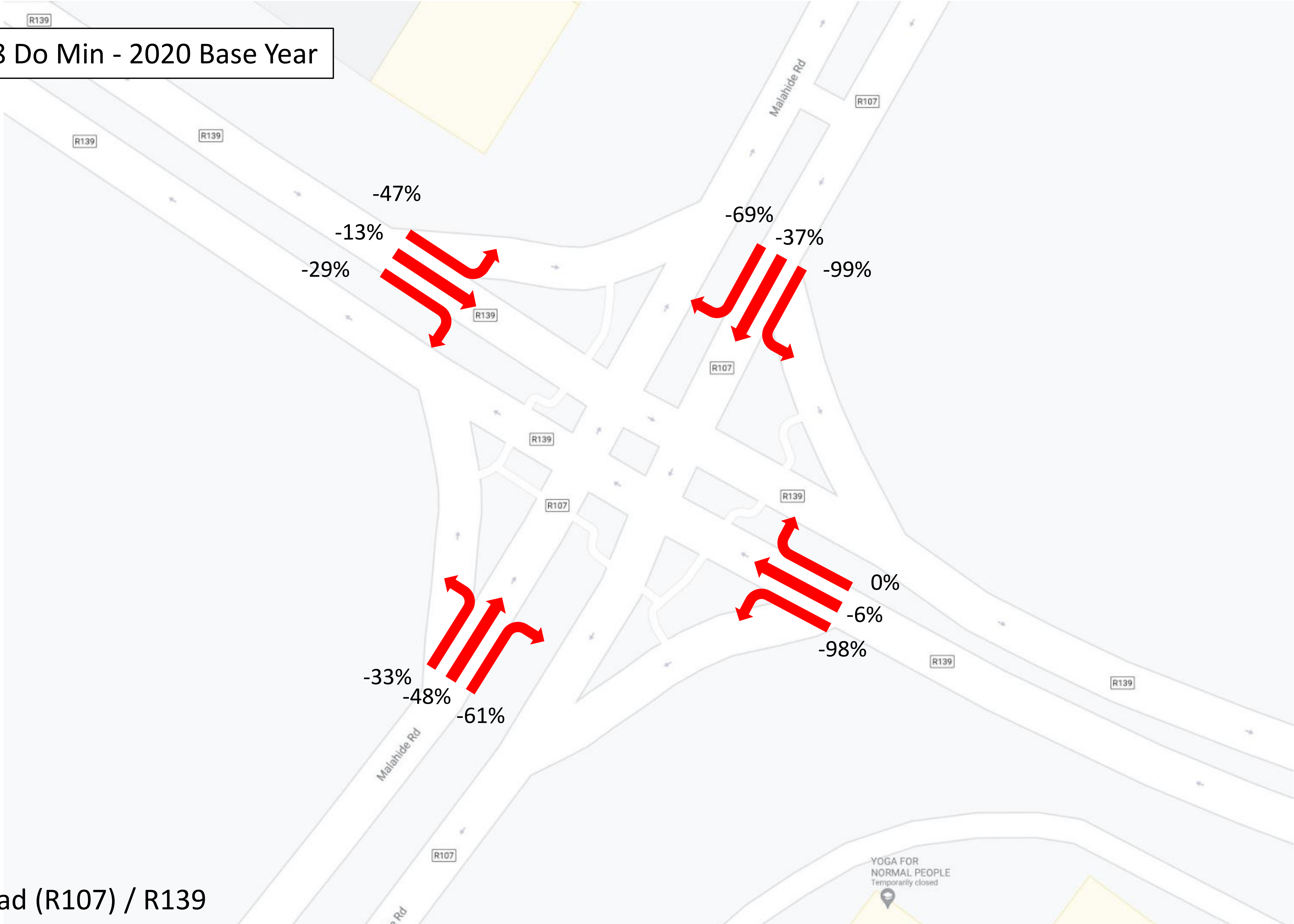
AM



Malahide Road (R107) / Belmayne

AM

2028 Do Min - 2020 Base Year



Malahide Road (R107) / R139

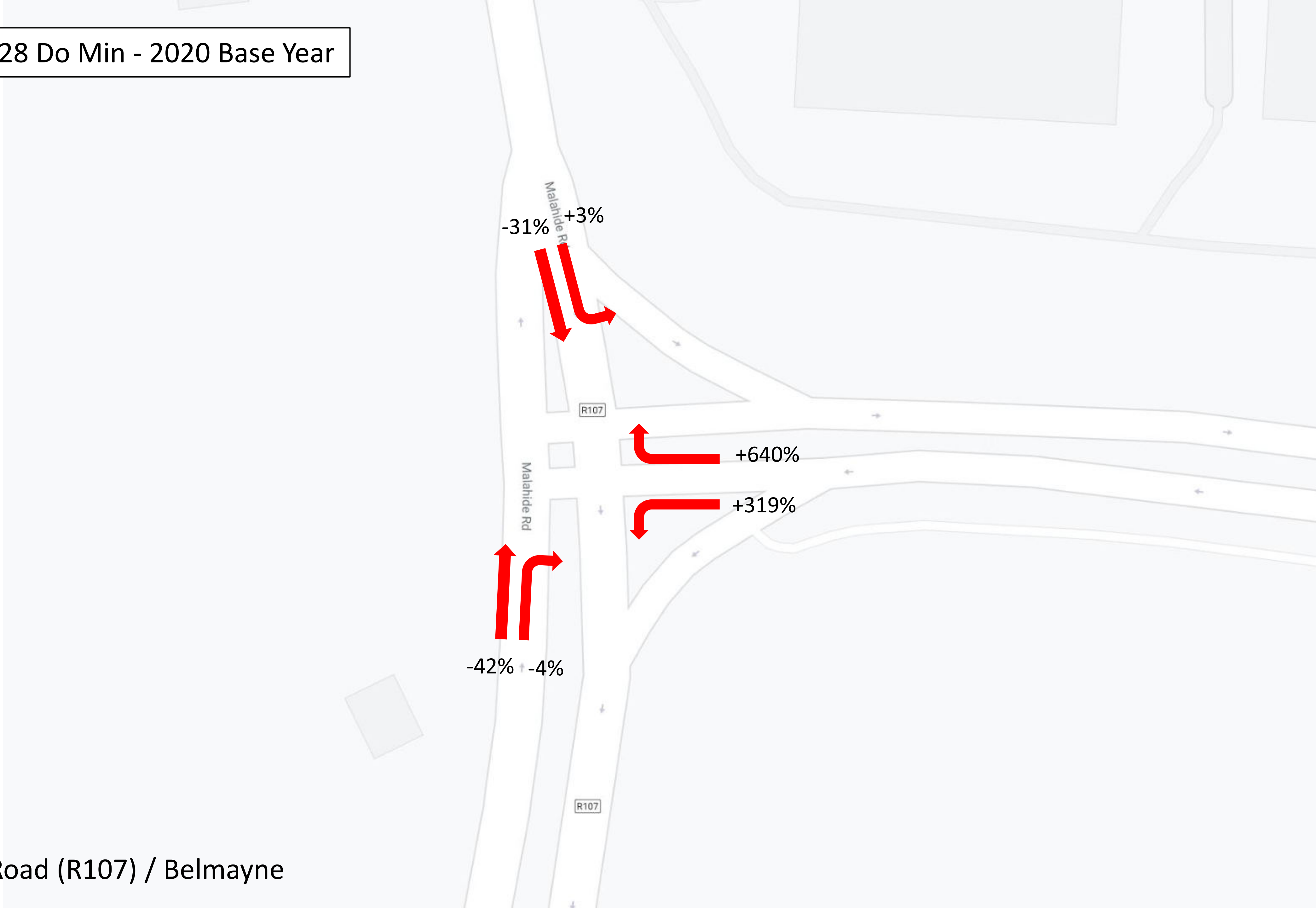
PM

2028 Do Min - 2020 Base Year

Malahide Road (R107) / Balgriffin Cottages

PM

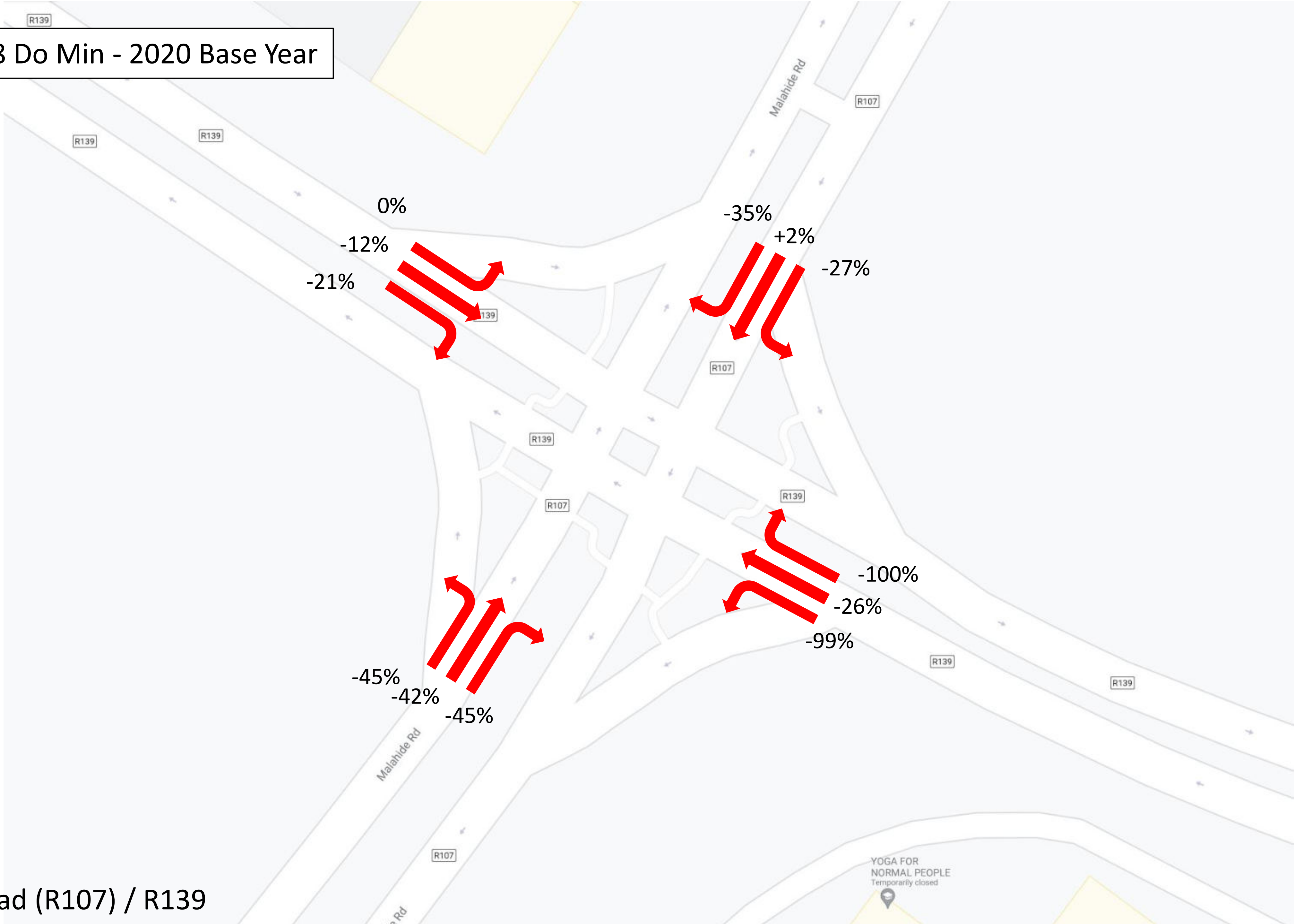
2028 Do Min - 2020 Base Year



Malahide Road (R107) / Belmayne

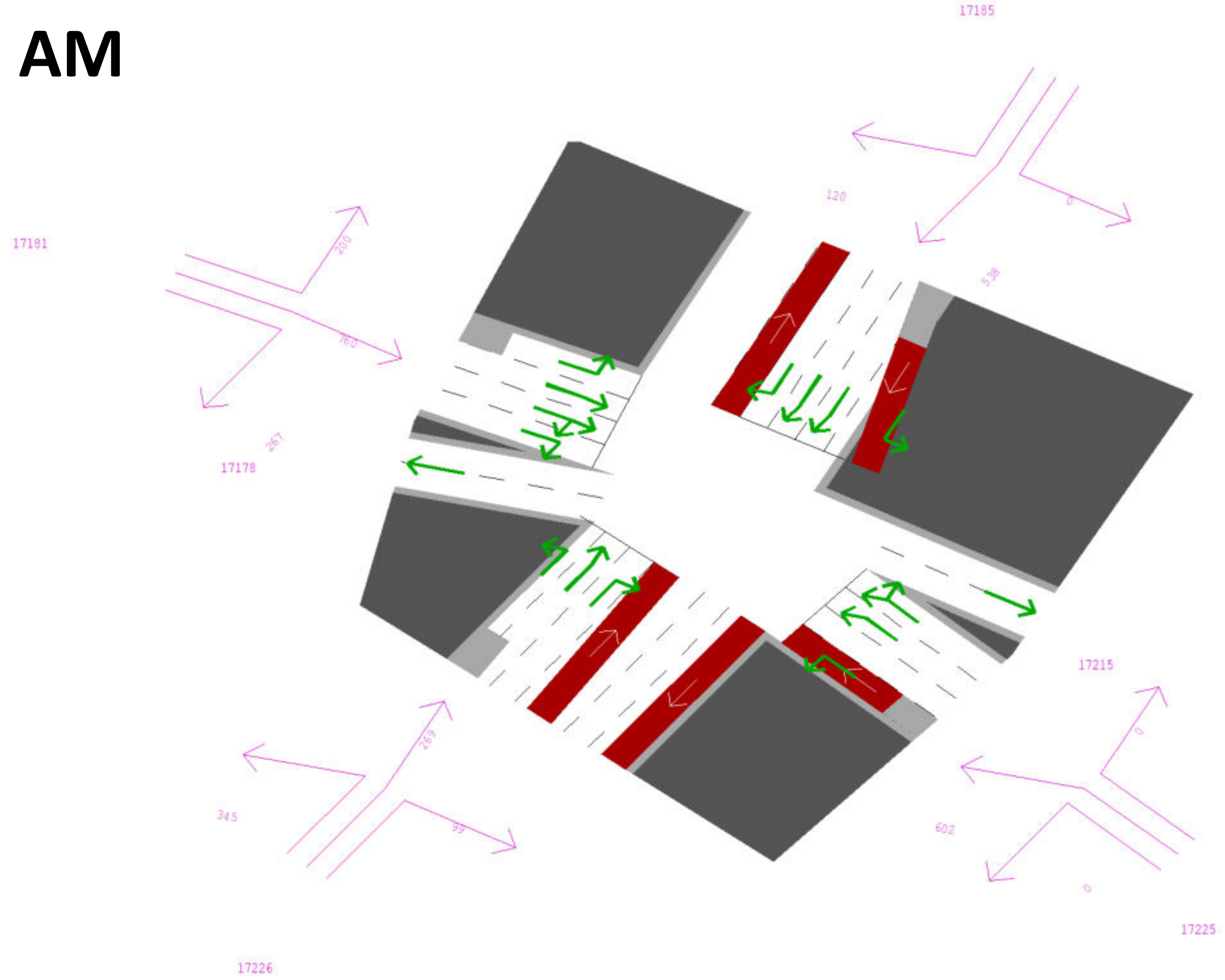
PM

2028 Do Min - 2020 Base Year



Malahide Road (R107) / R139

AM



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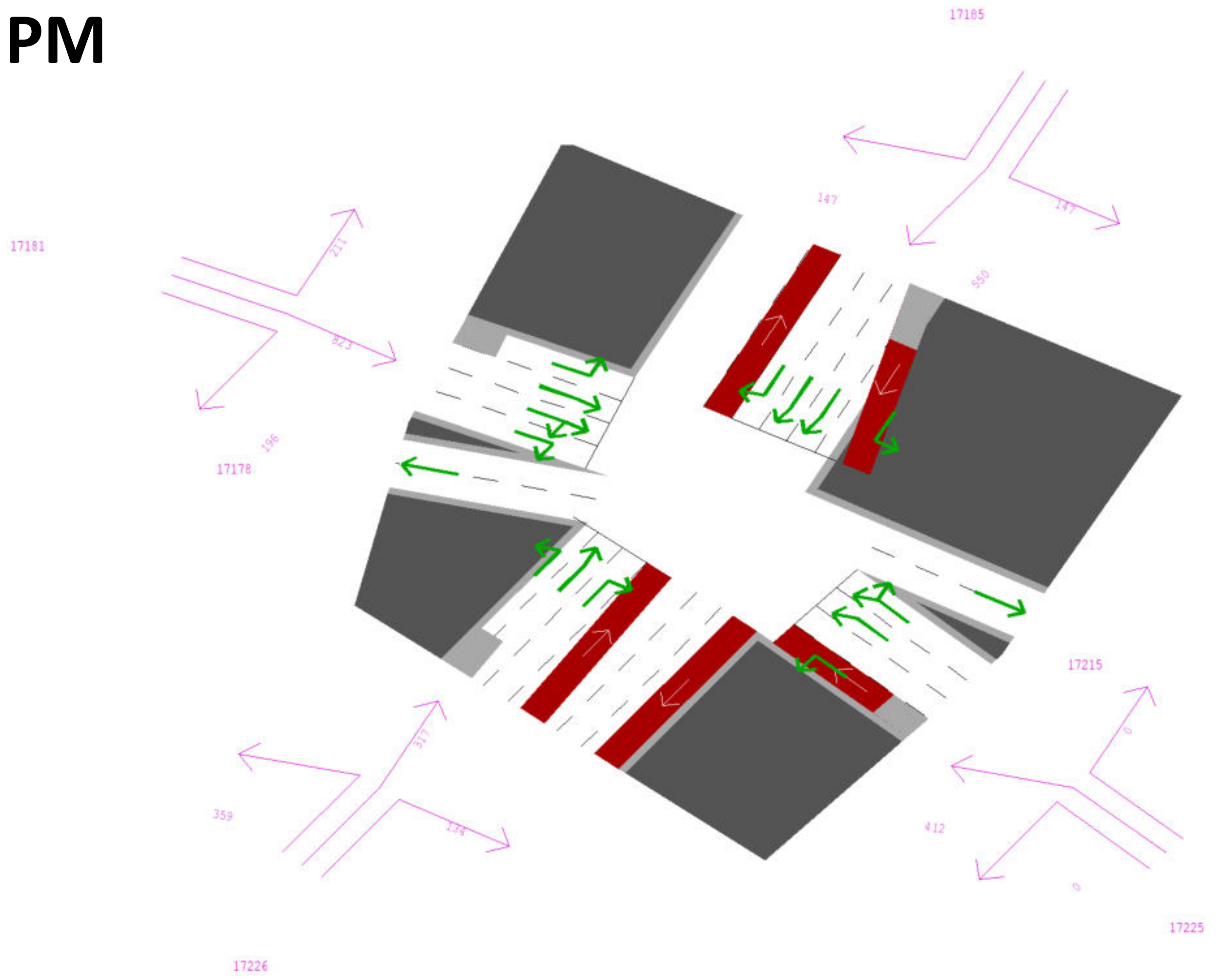
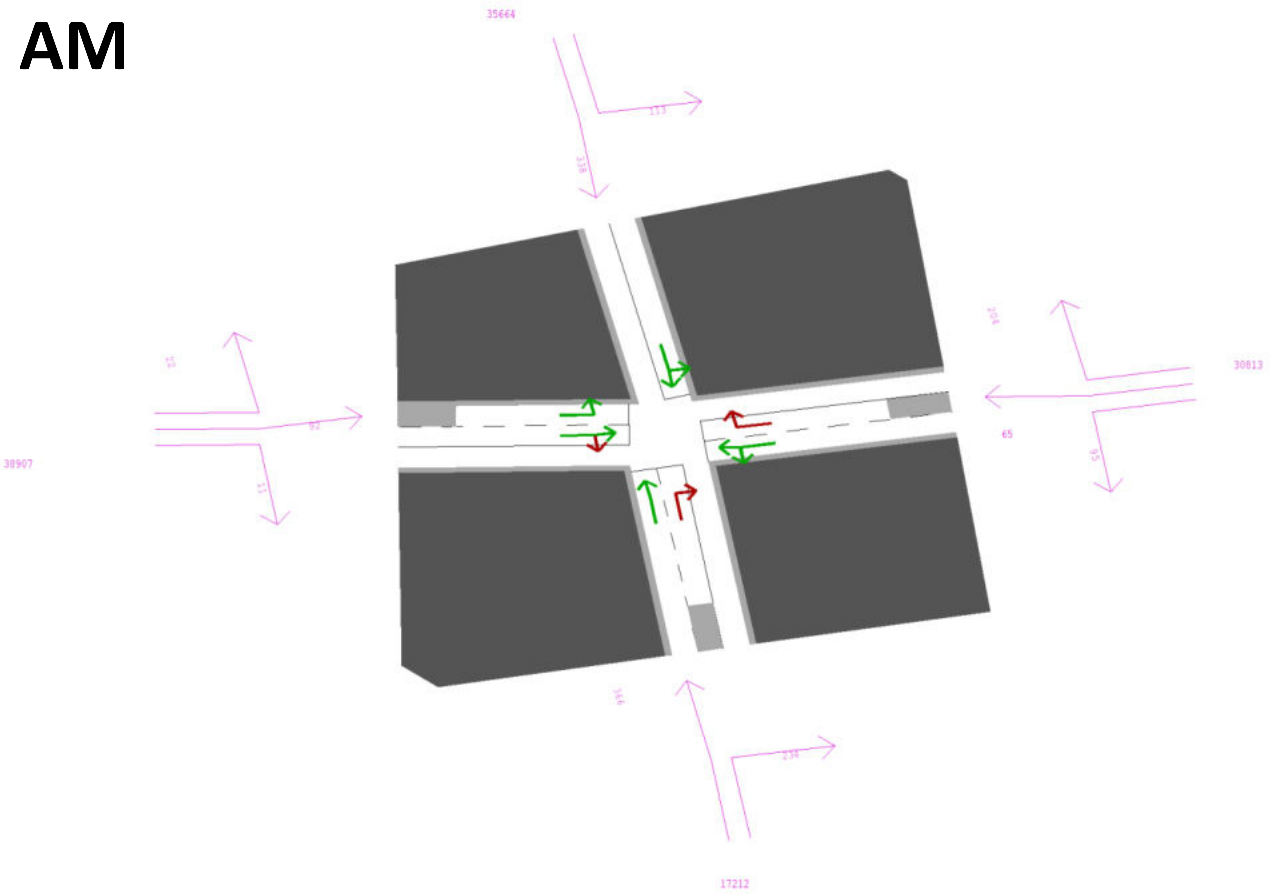


Junction 1 - Malahide Road (R107) / R139

AM



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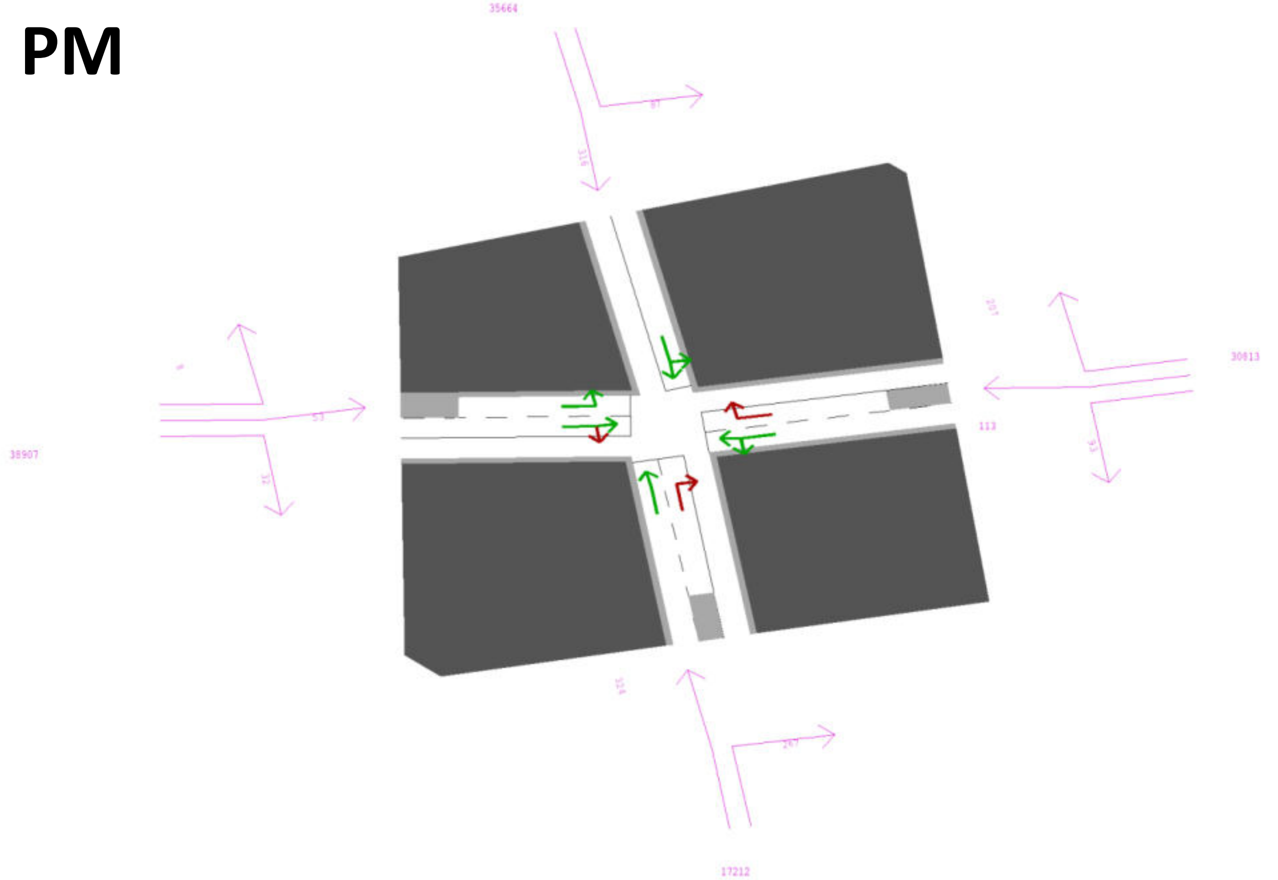
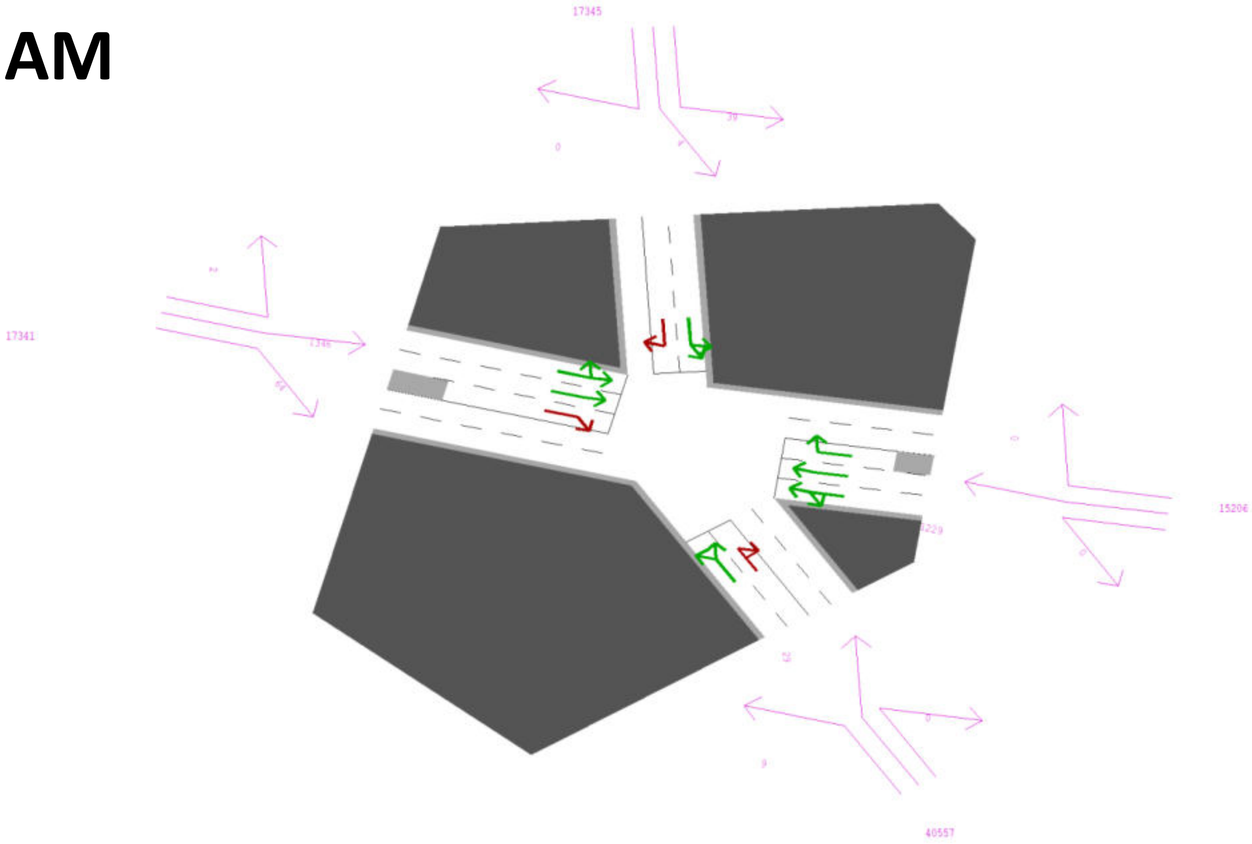


Junction 5 - Malahide Road (R107) / Balgriffin Cottages

AM



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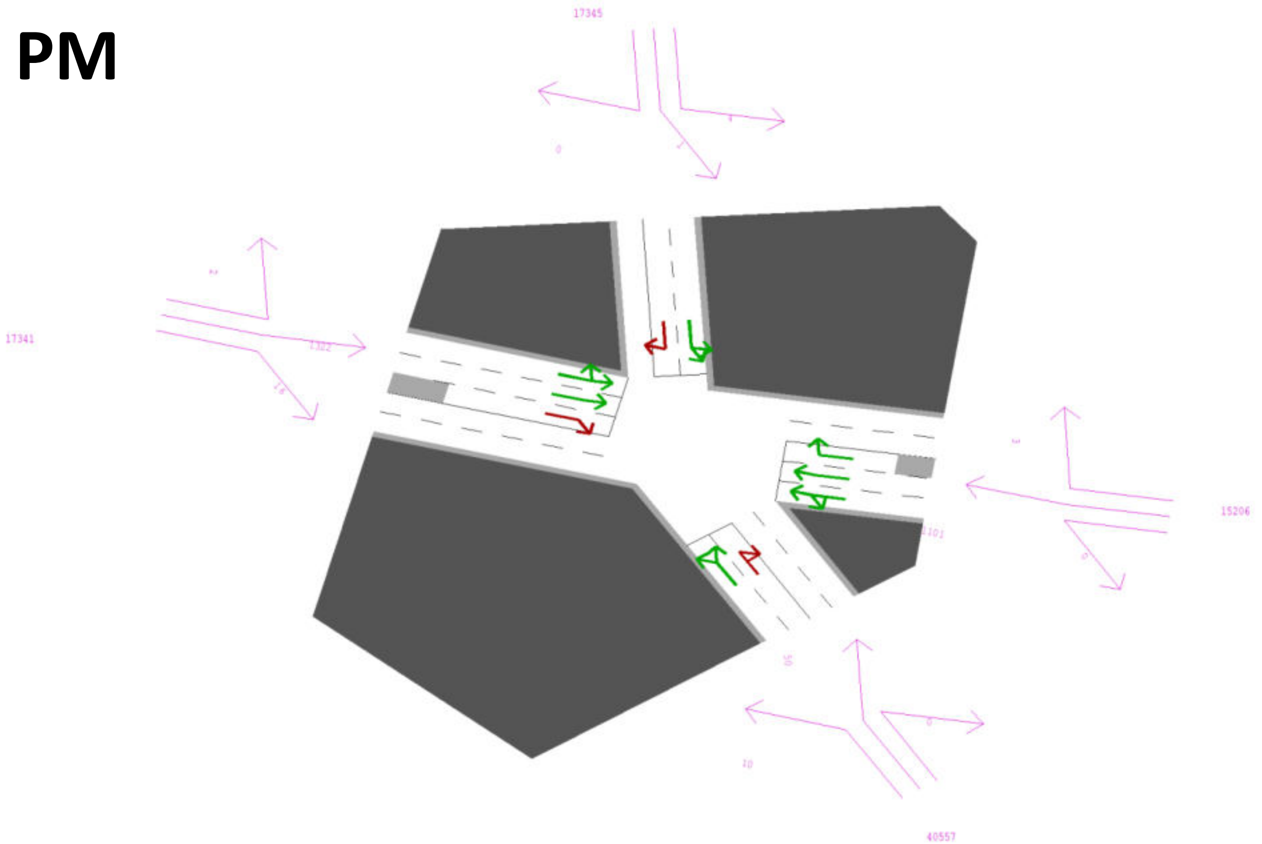
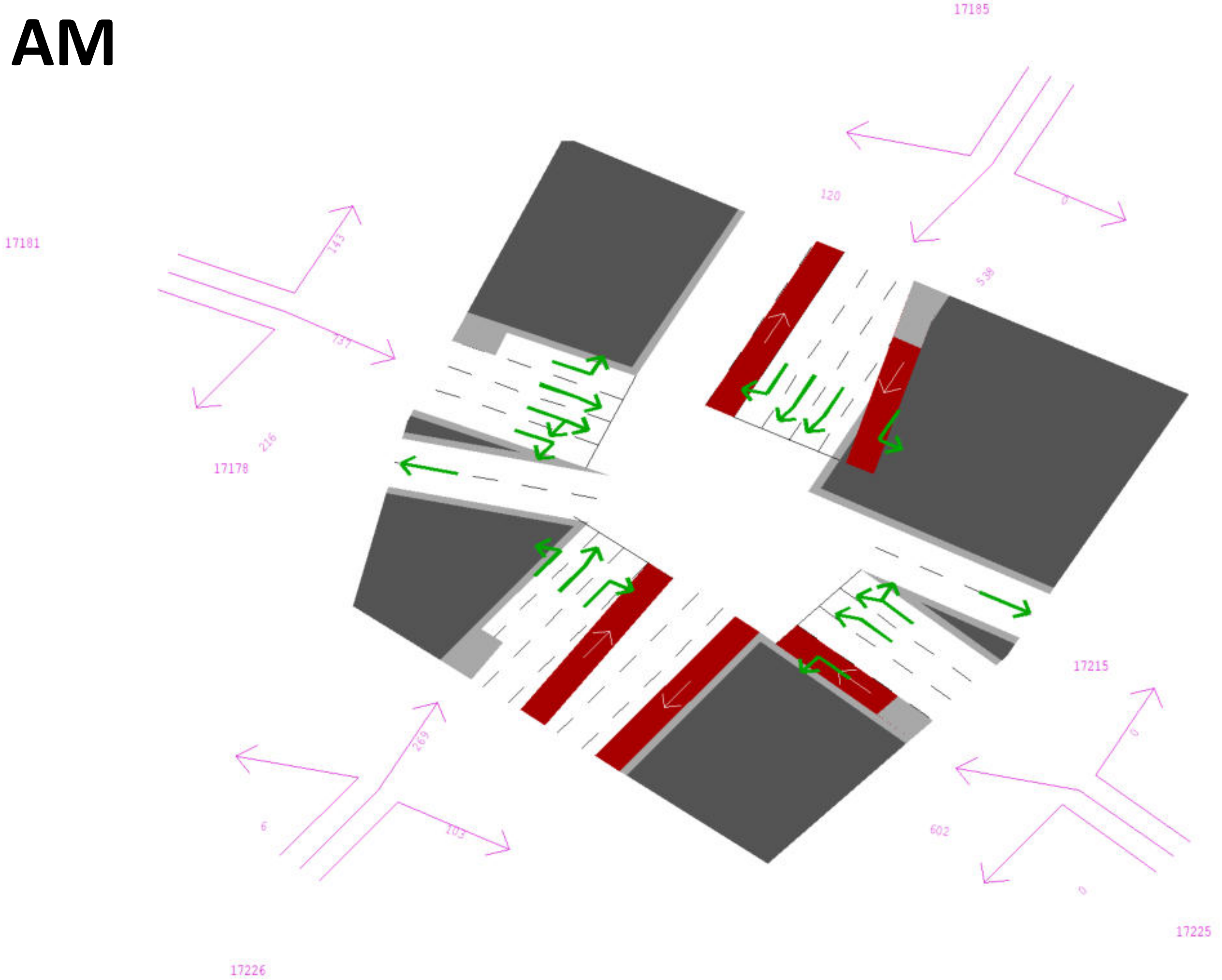


Junction 10 – Belcamp Parkway and R139

AM



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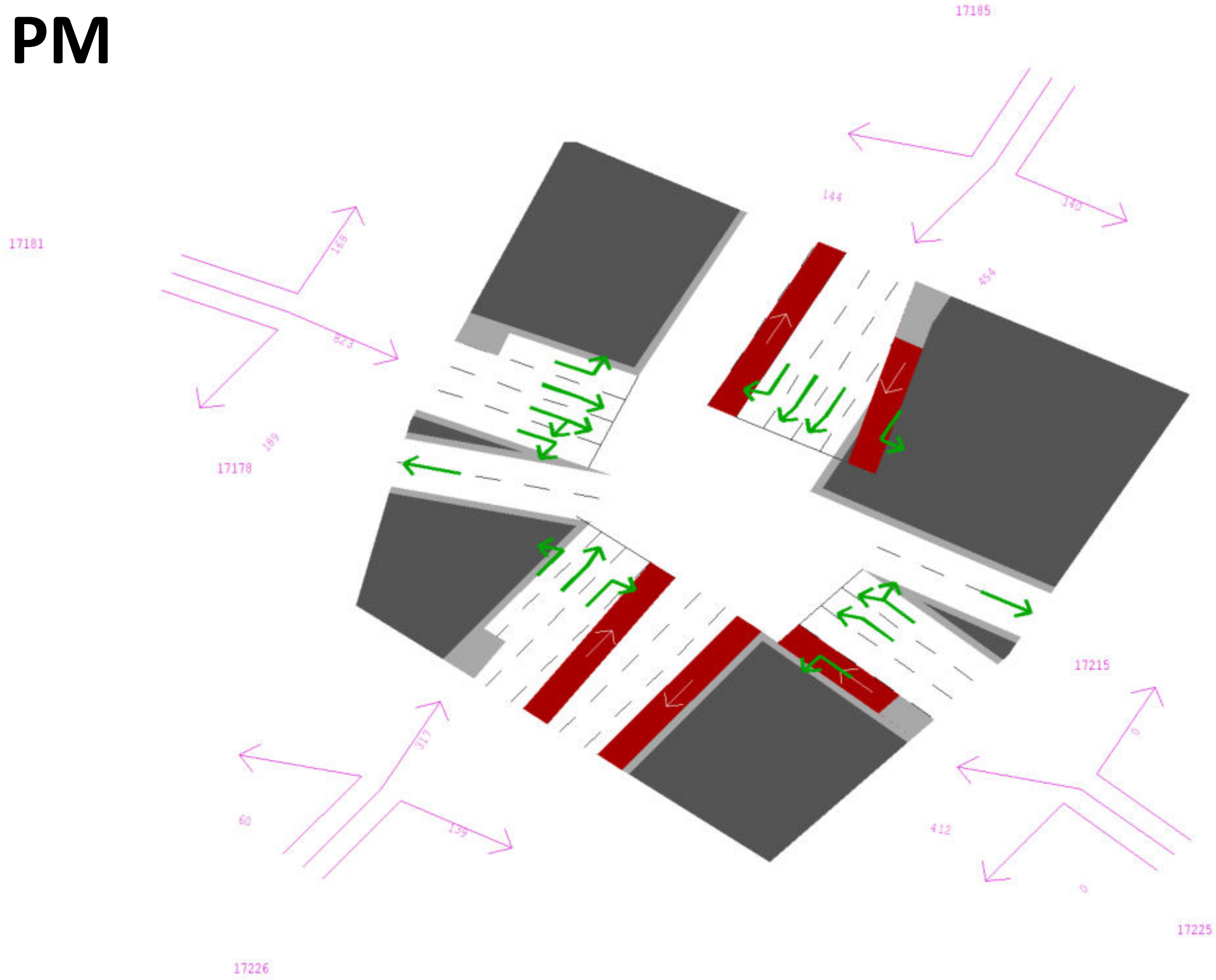
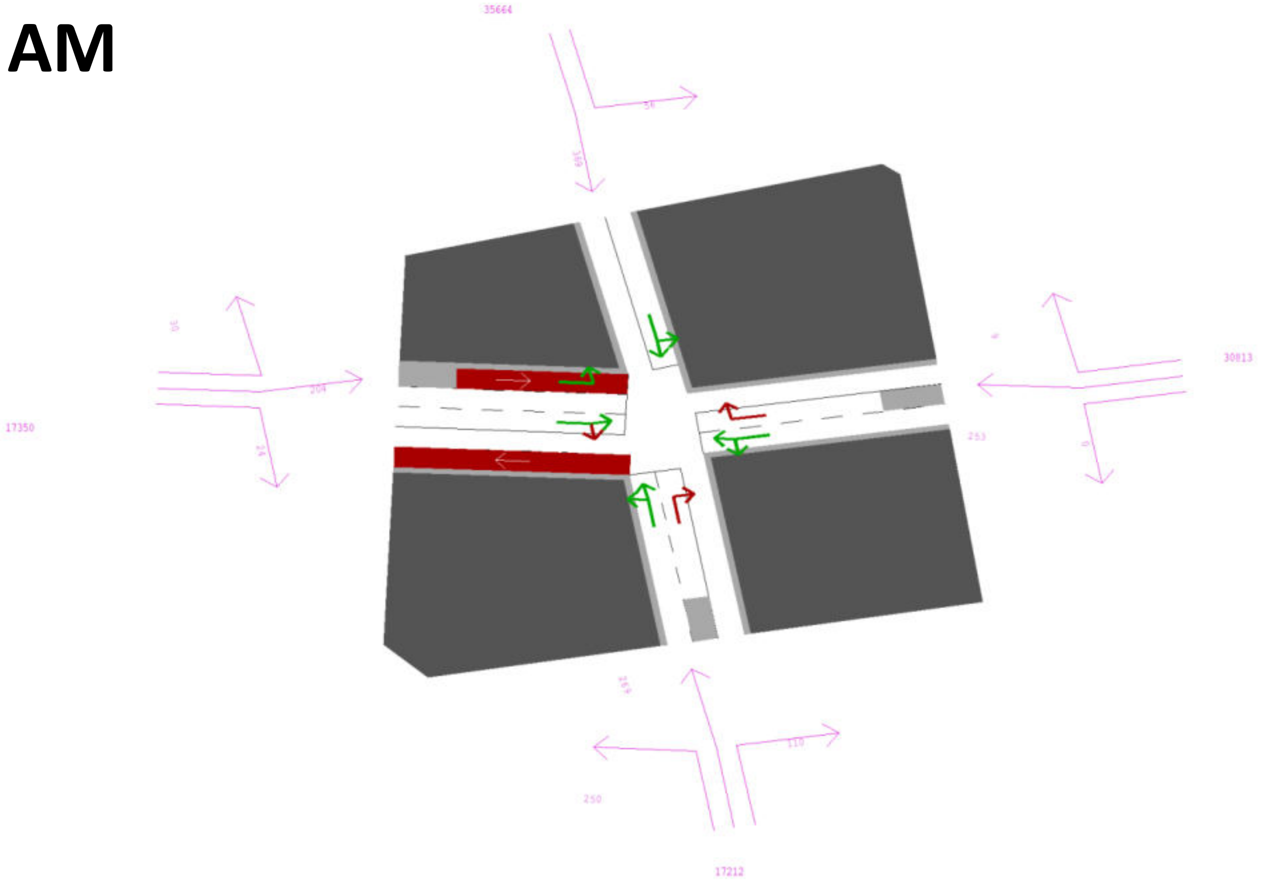


Junction 1 - Malahide Road (R107) / R139

AM



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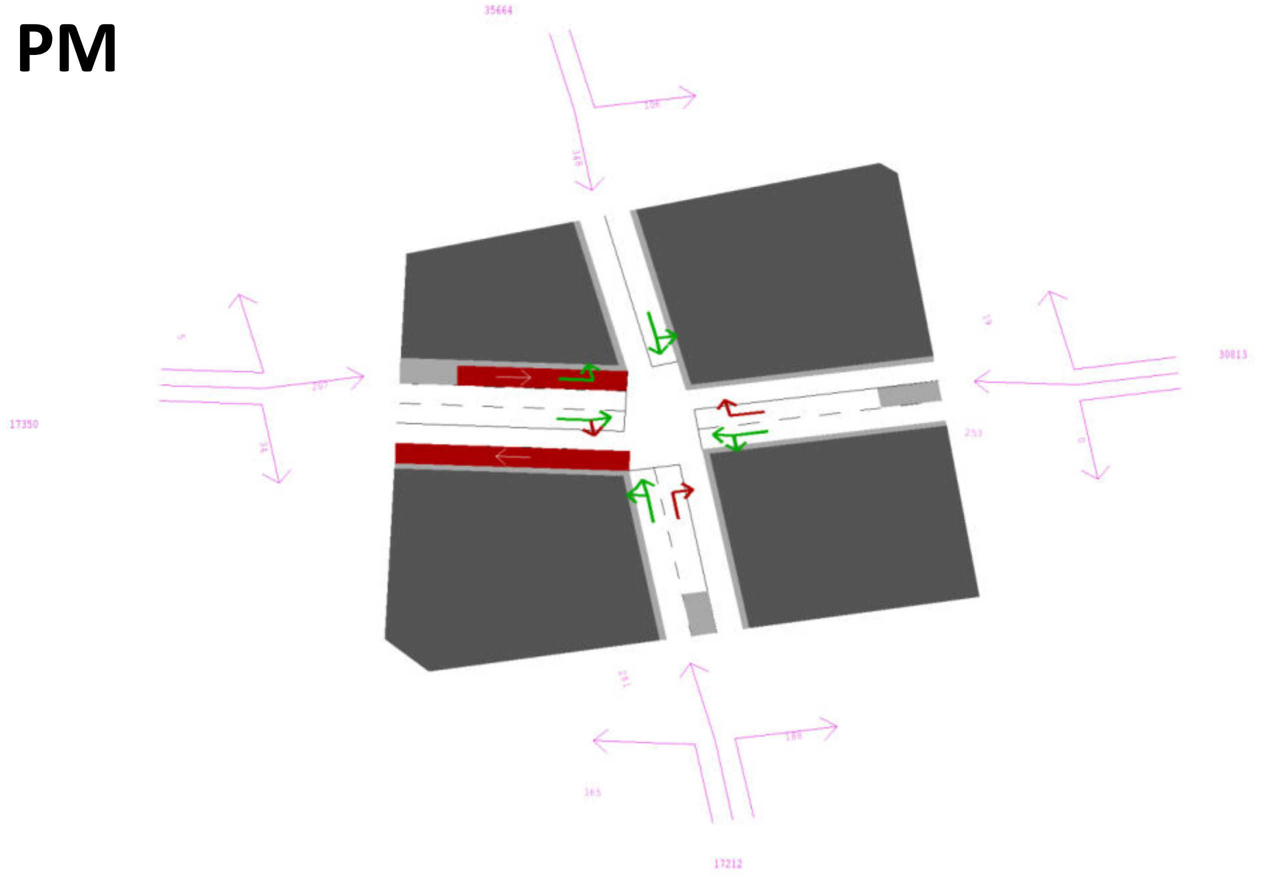
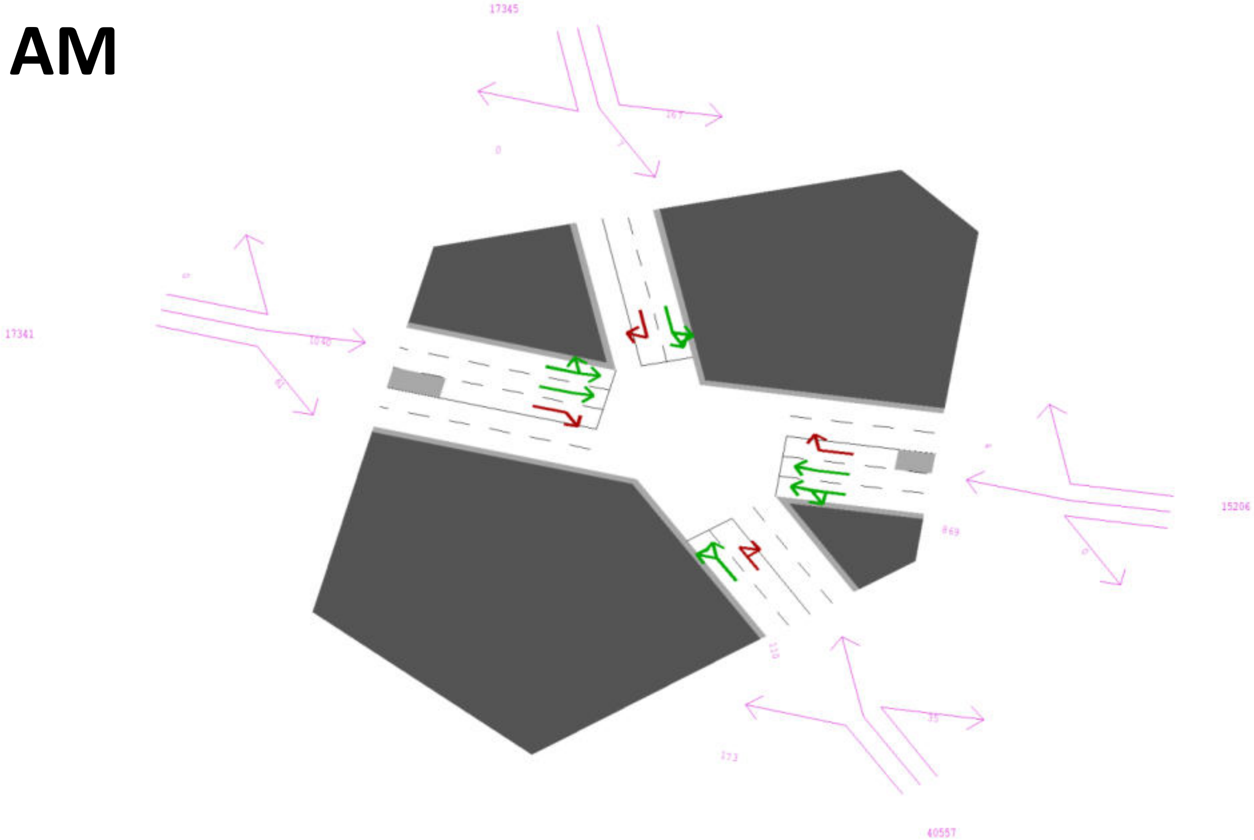


Junction 5 - Malahide Road (R107) / Balgriffin Cottages

AM



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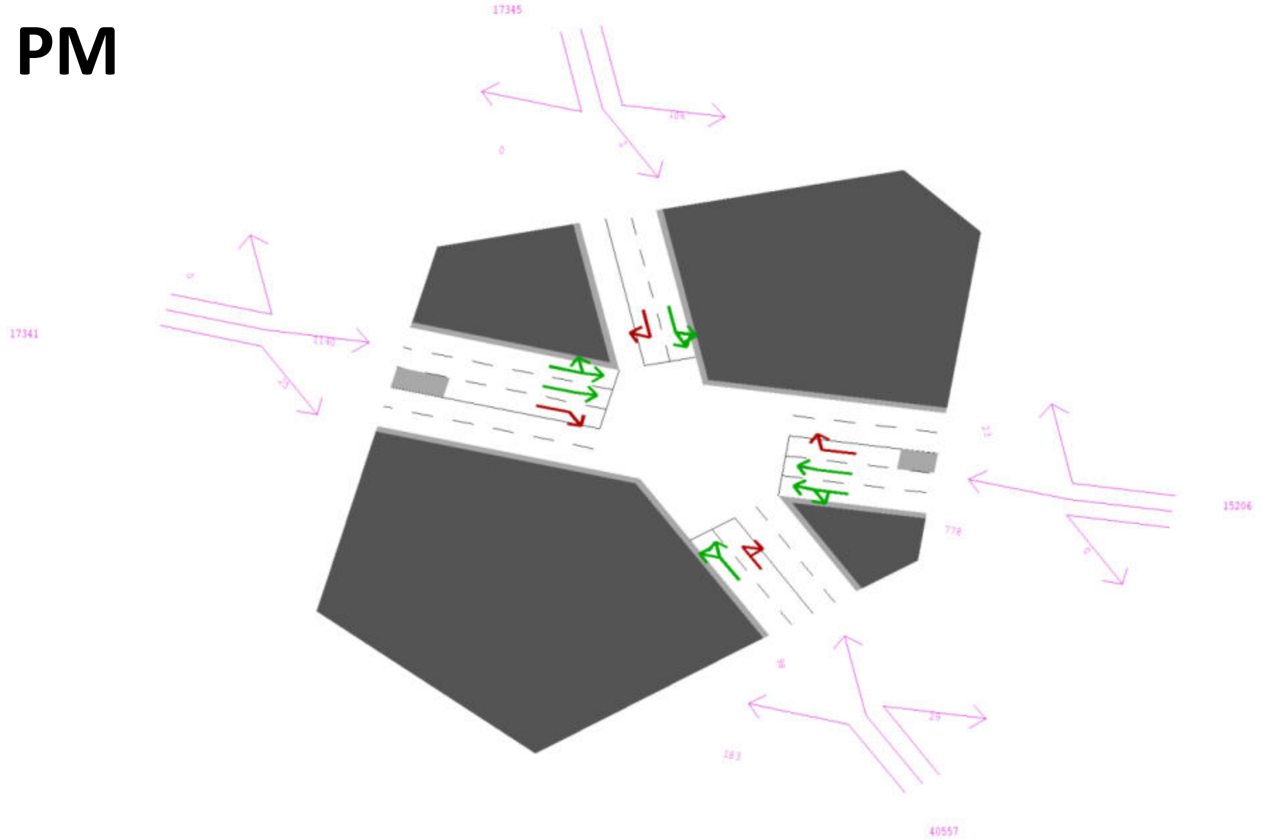


Junction 10 – Belcamp Parkway and R139

APPENDIX 12.3: JUNCTION MODELLING RESULTS

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 1 - 2028 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 1\Upgraded Layout
Report generation date: 28/04/2022 02:15:18

Summary of network performance

	AM			
	PI (£ per hr)	**Total delay (PCU-hr/hr)**	**Highest DOS**	**Number oversaturated**
	Junction 1 - 2028 "with development",			
Network	1000.60	68.79	105% (TS A/2)	1 (4%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

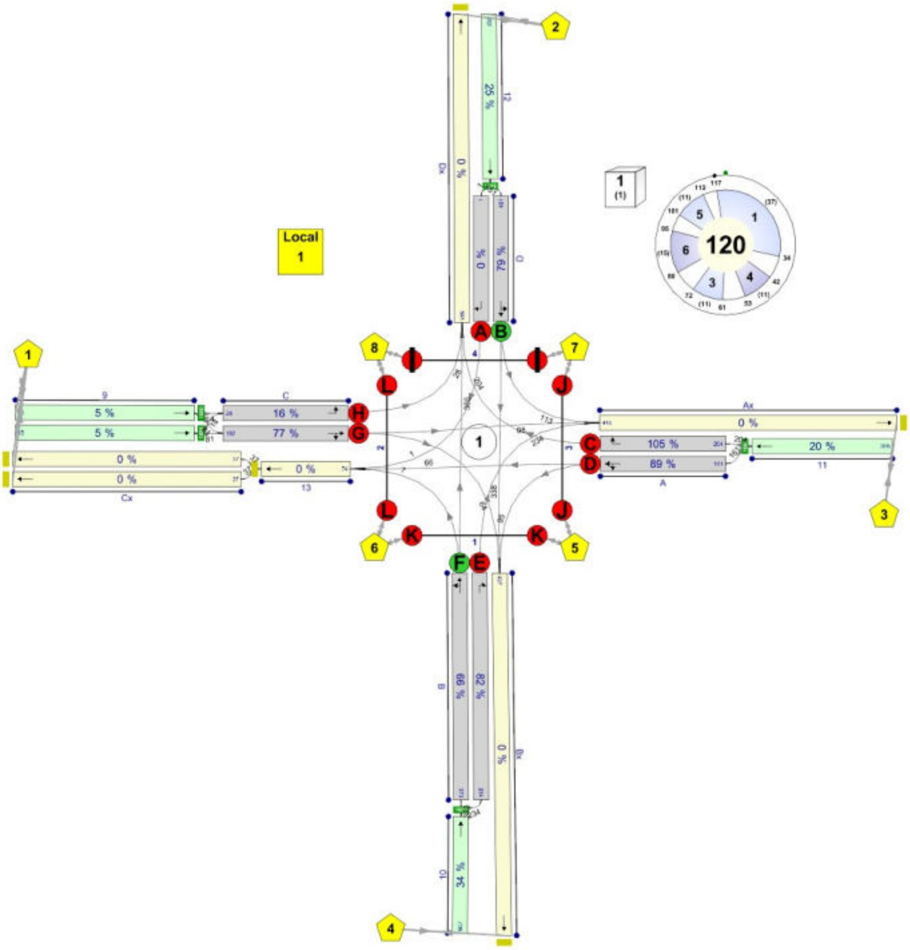
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	3.00	999	200	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 1
D1 - 2028 "with development",, AM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Arm Data	Arm 13	No traffic node specified for arm(s): 13

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 02:15:05	28/04/2022 02:15:10	5.24	08:00	120	1000.60	68.79	104.62	A/2	1	4	A/2	10/1

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 1			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development",	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1
11			1
12			1
13			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	63.49	✓	Sum of lanes	1800	✓		Normal	
	2			✓	60.67	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	203.69						Normal	
B	1	(untitled)		✓	97.37	✓	Sum of lanes	1800	✓		Normal	
	2			✓	102.39	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	233.18						Normal	
C	1	(untitled)		✓	63.36	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.22	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	100.70						Normal	
	2			✓	100.58						Normal	
D	1	(untitled)		✓	58.52	✓	Sum of lanes	1800	✓		Normal	
	2			✓	58.16	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	207.29						Normal	
9	1			✓	71.45	✓	Sum of lanes	1800			Normal	
	2			✓	71.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.60	✓	Sum of lanes	1800			Normal	
11	1			✓	56.09	✓	Sum of lanes	1800			Normal	
12	1			✓	65.81	✓	Sum of lanes	1800			Normal	
13	1			✓	122.47						Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
Ax	1	1	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
Cx	1	1	(untitled)			
	2	1	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
11	1	1	(untitled)			1800
12	1	1	(untitled)			1800
13	1	1	(untitled)			

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	161	161
	2	204	204
Ax	1	445	445
B	1	373	373
	2	234	234
Bx	1	497	497
C	1	28	28
	2	162	162
Cx	1	37	37
	2	37	37
D	1	451	451
	2	1	1
Dx	1	598	598
9	1	95	95
	2	95	95
10	1	607	607
11	1	365	365
12	1	452	452
13	1	74	74

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	D	
	2	1	C	
B	1	1	F	
	2	1	E	
C	1	1	H	
	2	1	G	
D	1	1	B	
	2	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
9	1	8.57	30.00
	2	8.57	30.00
10	1	5.59	30.00
11	1	6.73	30.00
12	1	7.90	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	11/1	A/1	7.62	30.00	✓	Straight	Straight Movement
	2	1	11/1	A/2	7.28	30.00	✓	Straight	Straight Movement
Ax	1	1	B/2	Ax/1	24.44	30.00	✓	Offside	47.99
B	1	1	10/1	B/1	11.68	30.00	✓	Straight	Straight Movement
	2	1	10/1	B/2	12.29	30.00	✓	Straight	Straight Movement
Bx	1	1	C/2	Bx/1	27.98	30.00	✓	Offside	56.60
C	1	1	9/2	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	1	9/2	C/2	7.59	30.00	✓	Straight	Straight Movement
Cx	1	1	13/1	Cx/1	12.08	30.00	✓	Straight	Straight Movement
	2	1	13/1	Cx/2	12.07	30.00	✓	Straight	Straight Movement
D	1	1	12/1	D/1	7.02	30.00	✓	Straight	Straight Movement
	2	1	12/1	D/2	6.98	30.00	✓	Straight	Straight Movement
Dx	1	1	B/1	Dx/1	24.88	30.00	✓	Straight	Straight Movement
13	1	1	B/1	13/1	14.70	30.00	✓	Nearside	41.84
Ax	1	2	D/1	Ax/1	24.44	30.00	✓	Nearside	39.46
Bx	1	2	D/1	Bx/1	27.98	30.00	✓	Straight	Straight Movement
C	1	2	9/1	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	2	9/1	C/2	7.59	30.00	✓	Straight	Straight Movement
Dx	1	2	C/1	Dx/1	24.88	30.00	✓	Nearside	36.02
13	1	2	D/2	13/1	14.70	30.00	✓	Offside	52.19
Ax	1	3	C/2	Ax/1	24.44	30.00	✓	Straight	Straight Movement
Bx	1	3	A/1	Bx/1	27.98	30.00	✓	Nearside	40.20
Dx	1	3	A/2	Dx/1	24.88	30.00	✓	Offside	48.68
13	1	3	A/1	13/1	14.70	30.00	✓	Straight	Straight Movement

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	K	
2	1	L	
3	1	J	
4	1	I	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	28	98	64	0	0	0	0
	2	1	0	113	338	0	0	0	0
	3	66	204	0	95	0	0	0	0
	4	7	366	234	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	9/2, 9/1	Cx/2, Cx/1	#0000FF
	2	(untitled)	12/1	Dx/1	#FF0000
	3	(untitled)	11/1	Ax/1	#00FF00
	4	(untitled)	10/1	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	9		4	3	10/1, B/2, Ax/1	Normal	234
	10		4	2	10/1, B/1, Dx/1	Normal	366
	11		4	1	10/1, B/1, 13/1, Cx/1	Normal	4
	12		4	1	10/1, B/1, 13/1, Cx/2	Normal	4
	13		1	2	9/2, C/1, Dx/1	Normal	14
	14		1	2	9/1, C/1, Dx/1	Normal	14
	16		1	4	9/2, C/2, Bx/1	Normal	32
	19		2	1	12/1, D/2, 13/1, Cx/1	Normal	1
	20		2	1	12/1, D/2, 13/1, Cx/2	Normal	1
	21		2	4	12/1, D/1, Bx/1	Normal	338
	24		3	1	11/1, A/1, 13/1, Cx/1	Normal	33
	25		3	1	11/1, A/1, 13/1, Cx/2	Normal	33
	26		3	4	11/1, A/1, Bx/1	Normal	95
	44		1	4	9/1, C/2, Bx/1	Normal	32
	45		2	3	12/1, D/1, Ax/1	Normal	113
	46		3	2	11/1, A/2, Dx/1	Normal	204
	47		1	3	9/2, C/2, Ax/1	Normal	49
	48		1	3	9/1, C/2, Ax/1	Normal	49

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	17		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		8	NetworkDefault	120	60

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	A	(untitled)	5	300	0	0	Unknown	
	B	(untitled)	5	300	0	0	Unknown	
	C	(untitled)	5	12	0	0	Unknown	
	D	(untitled)	5	12	0	0	Unknown	
	E	(untitled)	5	300	0	0	Unknown	
	F	(untitled)	5	300	0	0	Unknown	
	G	(untitled)	5	300	0	0	Unknown	
	H	(untitled)	5	300	0	0	Unknown	
	I	(untitled)	5	300	0	0	Pedestrian	0
	J	(untitled)	5	300	0	0	Pedestrian	0
	K	(untitled)	5	300	0	0	Pedestrian	0
	L	(untitled)	5	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	B, F	1	0	0
	2	F, E	1	0	0
	3	C, D	1	0	0
	4	H, G	1	0	0
	5	I, L, J, K	1	0	0
	6	E, A	1	0	0

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 3, 4, 5, 6	17, 43, 66, 92, 113	63	
	2	(untitled)	Single	1, 3, 4, 6, 5	17, 43, 67, 93, 115	61	
	3	(untitled)	Single	1, 3, 5, 4, 6	16, 41, 69, 89, 113	67	
	4	(untitled)	Single	1, 3, 5, 6, 4	16, 41, 69, 90, 112	66	
	5	(untitled)	Single	1, 3, 6, 4, 5	17, 42, 66, 89, 115	64	
	6	(untitled)	Single	1, 3, 6, 5, 4	17, 43, 68, 91, 112	61	
	7	(untitled)	Single	1, 4, 3, 5, 6	16, 40, 64, 92, 113	65	
	8	(untitled)	Single	1, 4, 3, 6, 5	34, 53, 72, 95, 112	60	
	9	(untitled)	Single	1, 4, 5, 3, 6	17, 42, 68, 89, 113	63	
	10	(untitled)	Single	1, 4, 5, 6, 3	17, 41, 67, 88, 112	64	

Intergreen Matrix for Controller Stream 1

		To											
		A	B	C	D	E	F	G	H	I	J	K	L
From	A			5	5		7	7		6			0
	B			5	9	6		5		6	10	0	
	C	8	5			5	5	5	7	12	6		
	D	5	5			5	8	5			6	10	0
	E		7	8	5			5			0	6	
	F	7		7	5			6	8	0		6	11
	G	5	8	7	8	9	5				0	0	6
	H			5			5			10			6
	I	4	4	4			4		4				
	J		5	5	5	5		5					
	K		4		4	4	4	4					
	L	5			5		5	5	5				

Banned Stage transitions for Controller Stream 1

		To					
		1	2	3	4	5	6
From	1						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	2	3	4	5	6
From	1	0	6	9	8	11	7
	2	7	0	8	8	11	7
	3	8	8	0	7	12	8
	4	8	9	8	0	10	9
	5	5	5	5	5	0	5
	6	7	7	8	7	6	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	B,F	117	34	37	1	5
	2	✓	4	H,G	42	53	11	1	5
	3	✓	3	C,D	61	72	11	1	5
	4	✓	6	E,A	80	95	15	1	5
	5	✓	5	I,L,J,K	101	112	11	1	5

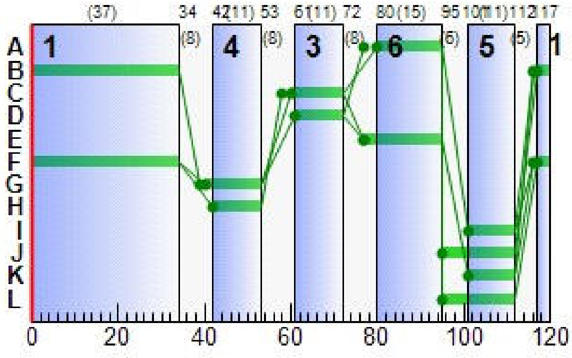
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	80	95	15
	B	1	✓	117	34	37
	C	1	✓	60	72	12
	D	1	✓	61	72	11
	E	1	✓	77	95	18
	F	1	✓	117	34	37
	G	1	✓	40	53	13
	H	1	✓	42	53	11
	I	1	✓	101	112	11
	J	1	✓	95	112	17
	K	1	✓	101	112	11
	L	1	✓	95	112	17

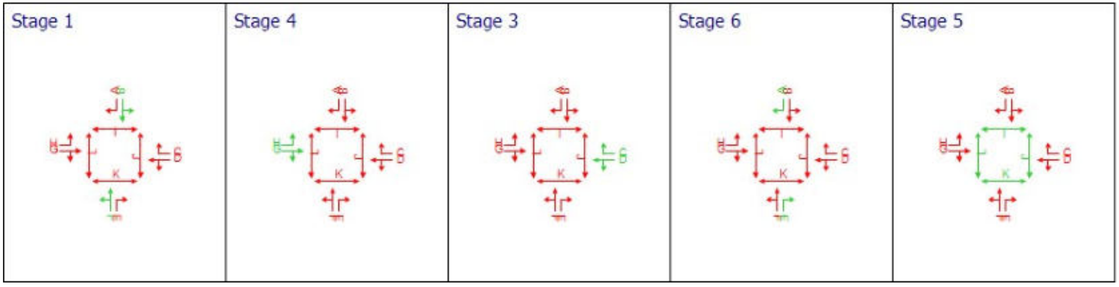
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	**1**	1	1	D	61	72	11
A	**2**	1	1	C	60	72	12
B	**1**	1	1	F	117	34	37
B	**2**	1	1	E	77	95	18
C	**1**	1	1	H	42	53	11
C	**2**	1	1	G	40	53	13
D	**1**	1	1	B	117	34	37
D	**2**	1	1	A	80	95	15

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	D	161	1800	11	0.00	89	12	122.35	114.73	142.43	8.02
	2		1	1	C	204 <	1800	12	0.00	105	-4	221.87	214.59	203.24	15.71 +
Ax	**1**	(untitled)				445	Unrestricted	120	8.00	0	Unrestricted	24.44	0.00	0.00	0.00
B	**1**	(untitled)	1	1	F	374	1800	37	0.00	66	52	53.00	41.32	89.45	11.32
	2		1	1	E	234	1800	18	0.00	82	22	87.51	75.22	115.92	9.25
Bx	**1**	(untitled)				497	Unrestricted	120	24.00	0	Unrestricted	27.98	0.00	0.00	0.00
C	**1**	(untitled)	1	1	H	28	1800	11	10.00	16	543	58.86	51.26	91.37	0.86
	2		1	1	G	162	1800	13	0.00	77	30	85.78	78.19	116.70	6.42
Cx	**1**	(untitled)				37	Unrestricted	120	99.00	0	Unrestricted	12.08	0.00	0.00	0.00
	2					37	Unrestricted	120	99.00	0	Unrestricted	12.07	0.00	0.00	0.00
D	**1**	(untitled)	1	1	B	451 <	1800	37	0.00	79	26	55.94	48.92	98.79	15.10 +
	2		1	1	A	0	1800	15	16.00	0	Unrestricted	0.00	0.00	0.00	0.00
Dx	**1**	(untitled)				589	Unrestricted	120	21.00	0	Unrestricted	24.88	0.00	0.00	0.00
9	**1**		1			95	1800	120	0.00	5	1795	8.63	0.06	0.00	0.00
	2		1			95	1800	120	0.00	5	1795	8.63	0.06	0.00	0.00
10	**1**		1			608	1800	120	0.00	34	196	6.10	0.51	0.00	0.09
11	**1**		1			365	1800	120	96.00	20	393	6.99	0.25	0.00	0.03
12	**1**		1			451	1800	120	40.00	25	299	8.23	0.33	0.00	0.04
13	**1**					74	Unrestricted	120	99.00	0	Unrestricted	14.70	0.00	0.00	0.00

Network Results

	Distance travelled (PCU-km/hr)	**Time spent (PCU-hr/hr)**	**Mean journey speed (kph)**	**Uniform delay (PCU-hr/hr)**	**Random plus oversat delay (PCU-hr/hr)**	**Weighted cost of delay (£ per hr)**	**Weighted cost of stops (£ per hr)**	**Excess queue penalty (£ per hr)**	**Performance Index (£ per hr)**
Normal traffic	558.58	55.29	10.10	19.52	17.16	520.79	23.72	0.00	544.51
Bus									
Tram									
Pedestrians	20.40	36.12	0.56	32.12	0.00	456.10	0.00	0.00	456.10
TOTAL	578.98	91.41	6.33	51.64	17.16	976.89	23.72	0.00	1000.60

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 1 - 2028 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 1\Upgraded Layout
Report generation date: 28/04/2022 02:19:06

Summary of network performance

	PM			
	PI (£ per hr)	**Total delay (PCU-hr/hr)**	**Highest DOS**	**Number oversaturated**
	Junction 1 - 2028 "with development"			
Network	894.63	61.46	94% (TS A/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

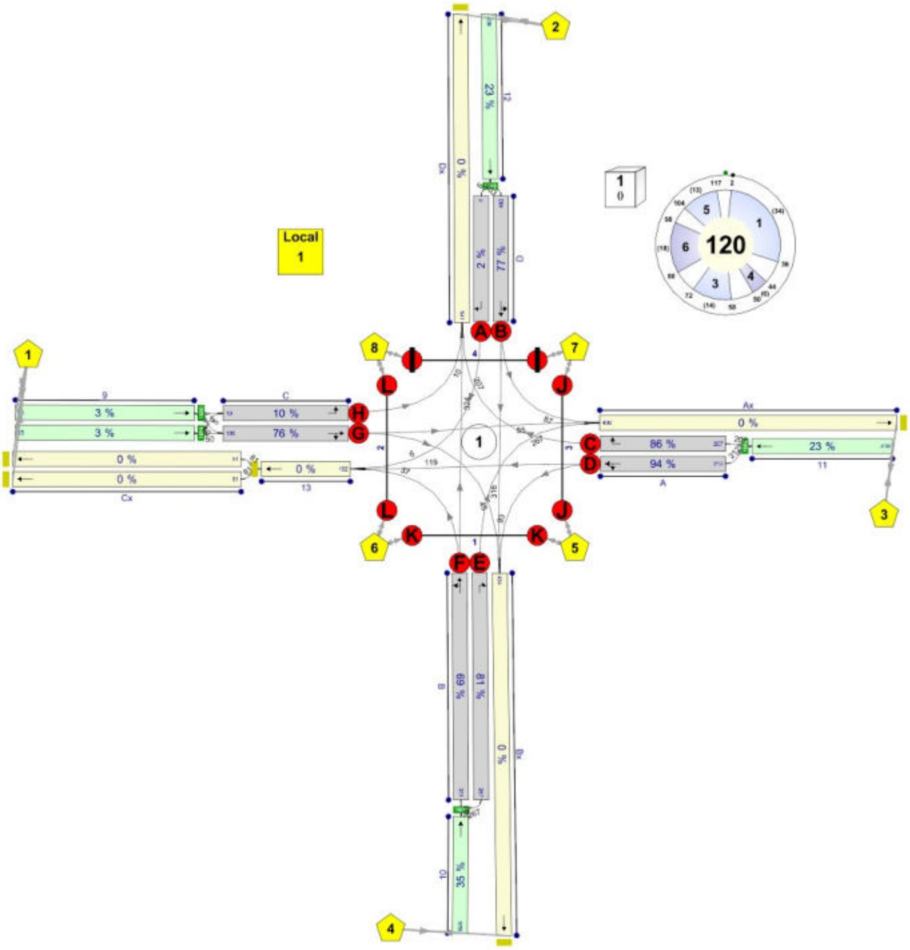
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 1
D1 - 2028 "with development", PM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Arm Data	Arm 13	No traffic node specified for arm(s): 13

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 02:16:21	28/04/2022 02:16:27	6.43	17:00	120	894.63	61.46	93.78	A/1	0	0	A/1	10/1

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 1			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1
11			1
12			1
13			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	63.49	✓	Sum of lanes	1800	✓		Normal	
	2			✓	60.67	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	203.69						Normal	
B	1	(untitled)		✓	97.37	✓	Sum of lanes	1800	✓		Normal	
	2			✓	102.39	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	233.18						Normal	
C	1	(untitled)		✓	63.36	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.22	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	100.70						Normal	
	2			✓	100.58						Normal	
D	1	(untitled)		✓	58.52	✓	Sum of lanes	1800	✓		Normal	
	2			✓	58.16	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	207.29						Normal	
9	1			✓	71.45	✓	Sum of lanes	1800			Normal	
	2			✓	71.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.60	✓	Sum of lanes	1800			Normal	
11	1			✓	56.09	✓	Sum of lanes	1800			Normal	
12	1			✓	65.81	✓	Sum of lanes	1800			Normal	
13	1			✓	122.47						Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
Ax	1	1	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
Cx	1	1	(untitled)			
	2	1	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
11	1	1	(untitled)			1800
12	1	1	(untitled)			1800
13	1	1	(untitled)			

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	212	212
	2	207	207
Ax	1	409	409
B	1	361	361
	2	267	267
Bx	1	454	454
C	1	10	10
	2	100	100
Cx	1	81	81
	2	81	81
D	1	403	403
	2	6	6
Dx	1	541	541
9	1	55	55
	2	55	55
10	1	628	628
11	1	419	419
12	1	409	409
13	1	162	162

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	D	
	2	1	C	
B	1	1	F	
	2	1	E	
C	1	1	H	
	2	1	G	
D	1	1	B	
	2	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
9	1	8.57	30.00
	2	8.57	30.00
10	1	5.59	30.00
11	1	6.73	30.00
12	1	7.90	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	11/1	A/1	7.62	30.00	✓	Straight	Straight Movement
	2	**1**	11/1	A/2	7.28	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	B/2	Ax/1	24.44	30.00	✓	Offside	47.99
B	**1**	**1**	10/1	B/1	11.68	30.00	✓	Straight	Straight Movement
	2	**1**	10/1	B/2	12.29	30.00	✓	Straight	Straight Movement
Bx	**1**	**1**	C/2	Bx/1	27.98	30.00	✓	Offside	56.60
C	**1**	**1**	9/2	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	C/2	7.59	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	13/1	Cx/1	12.08	30.00	✓	Straight	Straight Movement
	2	**1**	13/1	Cx/2	12.07	30.00	✓	Straight	Straight Movement
D	**1**	**1**	12/1	D/1	7.02	30.00	✓	Straight	Straight Movement
	2	**1**	12/1	D/2	6.98	30.00	✓	Straight	Straight Movement
Dx	**1**	**1**	B/1	Dx/1	24.88	30.00	✓	Straight	Straight Movement
13	**1**	**1**	B/1	13/1	14.70	30.00	✓	Nearside	41.84
Ax	**1**	**2**	D/1	Ax/1	24.44	30.00	✓	Nearside	39.46
Bx	**1**	**2**	D/1	Bx/1	27.98	30.00	✓	Straight	Straight Movement
C	**1**	**2**	9/1	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**2**	9/1	C/2	7.59	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	24.88	30.00	✓	Nearside	36.02
13	**1**	**2**	D/2	13/1	14.70	30.00	✓	Offside	52.19
Ax	**1**	**3**	C/2	Ax/1	24.44	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	A/1	Bx/1	27.98	30.00	✓	Nearside	40.20
Dx	**1**	**3**	A/2	Dx/1	24.88	30.00	✓	Offside	48.68
13	**1**	**3**	A/1	13/1	14.70	30.00	✓	Straight	Straight Movement

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	K	
2	1	L	
3	1	J	
4	1	I	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	10	55	45	0	0	0	0
	2	6	0	87	316	0	0	0	0
	3	119	207	0	93	0	0	0	0
	4	37	324	267	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	9/2, 9/1	Cx/2, Cx/1	#0000FF
	2	(untitled)	12/1	Dx/1	#FF0000
	3	(untitled)	11/1	Ax/1	#00FF00
	4	(untitled)	10/1	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	9		4	3	10/1, B/2, Ax/1	Normal	267
	10		4	2	10/1, B/1, Dx/1	Normal	324
	11		4	1	10/1, B/1, 13/1, Cx/1	Normal	19
	12		4	1	10/1, B/1, 13/1, Cx/2	Normal	19
	13		1	2	9/2, C/1, Dx/1	Normal	5
	14		1	2	9/1, C/1, Dx/1	Normal	5
	16		1	4	9/2, C/2, Bx/1	Normal	23
	19		2	1	12/1, D/2, 13/1, Cx/1	Normal	3
	20		2	1	12/1, D/2, 13/1, Cx/2	Normal	3
	21		2	4	12/1, D/1, Bx/1	Normal	316
	24		3	1	11/1, A/1, 13/1, Cx/1	Normal	60
	25		3	1	11/1, A/1, 13/1, Cx/2	Normal	60
	26		3	4	11/1, A/1, Bx/1	Normal	93
	44		1	4	9/1, C/2, Bx/1	Normal	23
	45		2	3	12/1, D/1, Ax/1	Normal	87
	46		3	2	11/1, A/2, Dx/1	Normal	207
	47		1	3	9/2, C/2, Ax/1	Normal	28
	48		1	3	9/1, C/2, Ax/1	Normal	28

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	17		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		8	NetworkDefault	120	60

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	A	(untitled)	5	300	0	0	Unknown	
	B	(untitled)	5	300	0	0	Unknown	
	C	(untitled)	5	15	0	0	Unknown	
	D	(untitled)	5	15	0	0	Unknown	
	E	(untitled)	5	300	0	0	Unknown	
	F	(untitled)	5	300	0	0	Unknown	
	G	(untitled)	5	300	0	0	Unknown	
	H	(untitled)	5	300	0	0	Unknown	
	I	(untitled)	5	300	0	0	Pedestrian	0
	J	(untitled)	5	300	0	0	Pedestrian	0
	K	(untitled)	5	300	0	0	Pedestrian	0
	L	(untitled)	5	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	B, F	1	1	100
	2	F, E	1	1	100
	3	C, D	1	1	100
	4	H, G	1	1	100
	5	I, L, J, K	1	1	100
	6	E, A	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 3, 4, 5, 6	17, 43, 66, 92, 113	63	
	2	(untitled)	Single	1, 3, 4, 6, 5	17, 43, 67, 93, 115	61	
	3	(untitled)	Single	1, 3, 5, 4, 6	16, 41, 69, 89, 113	67	
	4	(untitled)	Single	1, 3, 5, 6, 4	16, 41, 69, 90, 112	66	
	5	(untitled)	Single	1, 3, 6, 4, 5	17, 42, 66, 89, 115	64	
	6	(untitled)	Single	1, 3, 6, 5, 4	17, 43, 68, 91, 112	61	
	7	(untitled)	Single	1, 4, 3, 5, 6	16, 40, 64, 92, 113	65	
	8	(untitled)	Single	1, 4, 3, 6, 5	36, 50, 72, 98, 117	60	
	9	(untitled)	Single	1, 4, 5, 3, 6	17, 42, 68, 89, 113	63	
	10	(untitled)	Single	1, 4, 5, 6, 3	17, 41, 67, 88, 112	64	

Intergreen Matrix for Controller Stream 1

		To											
		A	B	C	D	E	F	G	H	I	J	K	L
From	A			5	5		7	7		6			0
	B			5	9	6		5		6	10	0	
	C	8	5			5	5	5	7	12	6		
	D	5	5			5	8	5			6	10	0
	E		7	8	5			5			0	6	
	F	7		7	5			6	8	0		6	11
	G	5	8	7	8	9	5				0	0	6
	H			5			5			10			6
	I	4	4	4			4		4				
	J		5	5	5	5		5					
	K		4		4	4	4	4					
	L	5			5		5	5	5				

Banned Stage transitions for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	9	8	11	7
	2	7	0	8	8	11	7
	3	8	8	0	7	12	8
	4	8	9	8	0	10	9
	5	5	5	5	5	0	5
	6	7	7	8	7	6	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	B,F	2	36	34	1	5
	2	✓	4	H,G	44	50	6	1	5
	3	✓	3	C,D	58	72	14	1	5
	4	✓	6	E,A	80	98	18	1	5
	5	✓	5	I,L,J,K	104	117	13	1	5

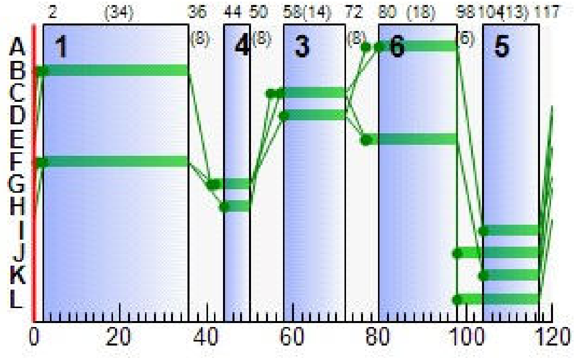
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	80	98	18
	B	**1**	✓	2	36	34
	C	**1**	✓	57	72	15
	D	**1**	✓	58	72	14
	E	**1**	✓	77	98	21
	F	**1**	✓	2	36	34
	G	**1**	✓	42	50	8
	H	**1**	✓	44	50	6
	I	**1**	✓	104	117	13
	J	**1**	✓	98	117	19
	K	**1**	✓	104	117	13
	L	**1**	✓	98	117	19

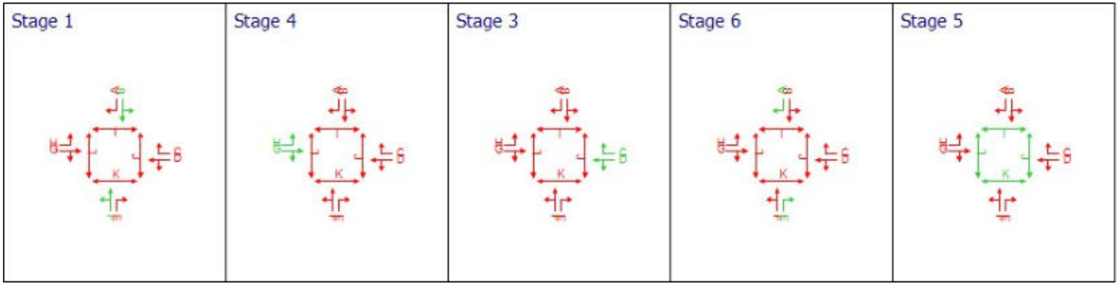
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	**1**	1	1	D	58	72	14
A	**2**	1	1	C	57	72	15
B	**1**	1	1	F	2	36	34
B	**2**	1	1	E	77	98	21
C	**1**	1	1	H	44	50	6
C	**2**	1	1	G	42	50	8
D	**1**	1	1	B	2	36	34
D	**2**	1	1	A	80	98	18

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

			SIGNALS			FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1	(untitled)	1	1	D	211	1800	14	0.00	94	7	129.81	122.19	148.02	11.03
	2		1	1	C	207	1800	15	0.00	86	16	97.76	90.48	126.80	9.00
Ax	1	(untitled)				410	Unrestricted	120	14.00	0	Unrestricted	24.44	0.00	0.00	0.00
B	1	(untitled)	1	1	F	362	1800	34	0.00	69	45	56.85	45.17	93.14	11.41
	2		1	1	E	267	1800	21	0.00	81	24	80.76	68.47	111.29	10.12
Bx	1	(untitled)				455	Unrestricted	120	30.00	0	Unrestricted	27.98	0.00	0.00	0.00
C	1	(untitled)	1	1	H	10	1800	6	6.00	10	950	63.08	55.48	94.68	0.32
	2		1	1	G	102	1800	8	0.00	76	32	99.18	91.59	125.20	4.37
Cx	1	(untitled)				81	Unrestricted	120	73.00	0	Unrestricted	12.08	0.00	0.00	0.00
	2					81	Unrestricted	120	73.00	0	Unrestricted	12.07	0.00	0.00	0.00
D	1	(untitled)	1	1	B	403 <	1800	34	0.00	77	30	56.78	49.76	98.46	13.43 +
	2		1	1	A	6	1800	18	18.00	2	4650	50.04	43.06	83.29	0.17
Dx	1	(untitled)				541	Unrestricted	120	27.00	0	Unrestricted	24.88	0.00	0.00	0.00
9	1		1			56	1800	120	120.00	3	3114	8.61	0.03	0.00	0.00
	2		1			56	1800	120	120.00	3	3114	8.61	0.03	0.00	0.00
10	1		1			629	1800	120	0.00	35	186	6.13	0.54	0.00	0.09
11	1		1			418	1800	120	0.00	23	331	7.03	0.30	0.00	0.04
12	1		1			409	1800	120	30.00	23	340	8.19	0.29	0.00	0.03
13	1					162	Unrestricted	120	61.00	0	Unrestricted	14.70	0.00	0.00	0.00

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	545.13	48.71	11.19	19.36	11.18	433.65	21.92	0.00	455.57
Bus									
Tram									
Pedestrians	20.40	34.92	0.58	30.92	0.00	439.06	0.00	0.00	439.06
TOTAL	565.53	83.63	6.76	50.28	11.18	872.71	21.92	0.00	894.63

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 1 - 2040 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 1\Upgraded Layout
Report generation date: 28/04/2022 02:24:05

Summary of network performance

	AM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 1 [A2] - 2040 "with development",			
Network	1010.08	69.47	105% (TS A/1)	1 (4%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

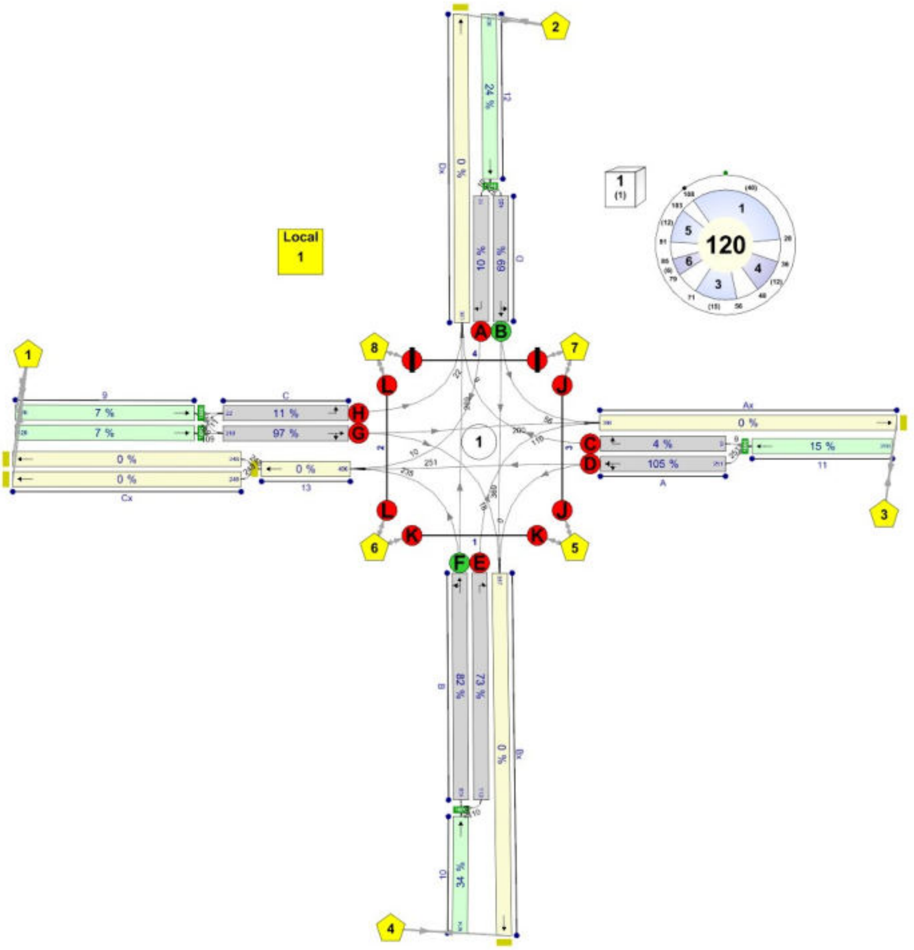
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	3.00	999	200	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 1 [A2]
D1 - 2040 "with development",, AM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Arm Data	Arm 13	No traffic node specified for arm(s): 13

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 02:23:47	28/04/2022 02:23:52	5.87	08:00	120	1010.08	69.47	105.00	A/1	1	4	A/1	10/1

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Junction 1 [A2]			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development",	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1
11			1
12			1
13			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	63.49	✓	Sum of lanes	1800	✓		Normal	
	2			✓	60.67	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	203.69						Normal	
B	1	(untitled)		✓	97.37	✓	Sum of lanes	1800	✓		Normal	
	2			✓	102.39	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	233.18						Normal	
C	1	(untitled)		✓	63.36	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.22	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	100.70						Normal	
	2			✓	100.58						Normal	
D	1	(untitled)		✓	58.52	✓	Sum of lanes	1800	✓		Normal	
	2			✓	58.16	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	207.29						Normal	
9	1			✓	71.45	✓	Sum of lanes	1800			Normal	
	2			✓	71.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.60	✓	Sum of lanes	1800			Normal	
11	1			✓	56.09	✓	Sum of lanes	1800			Normal	
12	1			✓	65.81	✓	Sum of lanes	1800			Normal	
13	1			✓	122.47						Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
Ax	1	1	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
Cx	1	1	(untitled)			
	2	1	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
11	1	1	(untitled)			1800
12	1	1	(untitled)			1800
13	1	1	(untitled)			

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	251	251
	2	9	9
Ax	1	366	366
B	1	504	504
	2	110	110
Bx	1	387	387
C	1	22	22
	2	218	218
Cx	1	248	248
	2	248	248
D	1	425	425
	2	10	10
Dx	1	300	300
9	1	120	120
	2	120	120
10	1	614	614
11	1	260	260
12	1	435	435
13	1	496	496

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	D	
	2	1	C	
B	1	1	F	
	2	1	E	
C	1	1	H	
	2	1	G	
D	1	1	B	
	2	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
9	1	8.57	30.00
	2	8.57	30.00
10	1	5.59	30.00
11	1	6.73	30.00
12	1	7.90	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	11/1	A/1	7.62	30.00	✓	Straight	Straight Movement
	2	**1**	11/1	A/2	7.28	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	B/2	Ax/1	24.44	30.00	✓	Offside	47.99
B	**1**	**1**	10/1	B/1	11.68	30.00	✓	Straight	Straight Movement
	2	**1**	10/1	B/2	12.29	30.00	✓	Straight	Straight Movement
Bx	**1**	**1**	C/2	Bx/1	27.98	30.00	✓	Offside	56.60
C	**1**	**1**	9/2	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	C/2	7.59	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	13/1	Cx/1	12.08	30.00	✓	Straight	Straight Movement
	2	**1**	13/1	Cx/2	12.07	30.00	✓	Straight	Straight Movement
D	**1**	**1**	12/1	D/1	7.02	30.00	✓	Straight	Straight Movement
	2	**1**	12/1	D/2	6.98	30.00	✓	Straight	Straight Movement
Dx	**1**	**1**	B/1	Dx/1	24.88	30.00	✓	Straight	Straight Movement
13	**1**	**1**	B/1	13/1	14.70	30.00	✓	Nearside	41.84
Ax	**1**	**2**	D/1	Ax/1	24.44	30.00	✓	Nearside	39.46
Bx	**1**	**2**	D/1	Bx/1	27.98	30.00	✓	Straight	Straight Movement
C	**1**	**2**	9/1	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**2**	9/1	C/2	7.59	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	24.88	30.00	✓	Nearside	36.02
13	**1**	**2**	D/2	13/1	14.70	30.00	✓	Offside	52.19
Ax	**1**	**3**	C/2	Ax/1	24.44	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	A/1	Bx/1	27.98	30.00	✓	Nearside	40.20
Dx	**1**	**3**	A/2	Dx/1	24.88	30.00	✓	Offside	48.68
13	**1**	**3**	A/1	13/1	14.70	30.00	✓	Straight	Straight Movement

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	K	
2	1	L	
3	1	J	
4	1	I	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	22	200	18	0	0	0	0
	2	10	0	56	369	0	0	0	0
	3	251	9	0	0	0	0	0	0
	4	235	269	110	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	9/2, 9/1	Cx/2, Cx/1	#0000FF
	2	(untitled)	12/1	Dx/1	#FF0000
	3	(untitled)	11/1	Ax/1	#00FF00
	4	(untitled)	10/1	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		4	3	10/1, B/2, Ax/1	Normal	110
	10		4	2	10/1, B/1, Dx/1	Normal	269
	11		4	1	10/1, B/1, 13/1, Cx/1	Normal	118
	12		4	1	10/1, B/1, 13/1, Cx/2	Normal	118
	13		1	2	9/2, C/1, Dx/1	Normal	11
	14		1	2	9/1, C/1, Dx/1	Normal	11
	16		1	4	9/2, C/2, Bx/1	Normal	9
	19		2	1	12/1, D/2, 13/1, Cx/1	Normal	5
	20		2	1	12/1, D/2, 13/1, Cx/2	Normal	5
	21		2	4	12/1, D/1, Bx/1	Normal	369
	24		3	1	11/1, A/1, 13/1, Cx/1	Normal	126
	25		3	1	11/1, A/1, 13/1, Cx/2	Normal	126
	26		3	4	11/1, A/1, Bx/1	Normal	0
	44		1	4	9/1, C/2, Bx/1	Normal	9
	45		2	3	12/1, D/1, Ax/1	Normal	56
	46		3	2	11/1, A/2, Dx/1	Normal	9
	47		1	3	9/2, C/2, Ax/1	Normal	100
	48		1	3	9/1, C/2, Ax/1	Normal	100

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		8	NetworkDefault	120	60

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	**A**	(untitled)	5	300	0	0	Unknown	
	B	(untitled)	5	300	0	0	Unknown	
	C	(untitled)	5	16	0	0	Unknown	
	D	(untitled)	5	16	0	0	Unknown	
	E	(untitled)	5	300	0	0	Unknown	
	F	(untitled)	5	300	0	0	Unknown	
	G	(untitled)	5	14	0	0	Unknown	
	H	(untitled)	5	14	0	0	Unknown	
	I	(untitled)	5	300	0	0	Pedestrian	0
	J	(untitled)	5	300	0	0	Pedestrian	0
	K	(untitled)	5	300	0	0	Pedestrian	0
	L	(untitled)	5	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	B, F	1	1	100
	2	F, E	1	1	100
	3	C, D	1	1	100
	4	H, G	1	1	100
	5	I, L, J, K	1	1	100
	6	E, A	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 3, 4, 5, 6	17, 43, 66, 92, 113	63	
	2	(untitled)	Single	1, 3, 4, 6, 5	17, 43, 67, 93, 115	61	
	3	(untitled)	Single	1, 3, 5, 4, 6	16, 41, 69, 89, 113	67	
	4	(untitled)	Single	1, 3, 5, 6, 4	16, 41, 69, 90, 112	66	
	5	(untitled)	Single	1, 3, 6, 4, 5	17, 42, 66, 89, 115	64	
	6	(untitled)	Single	1, 3, 6, 5, 4	17, 43, 68, 91, 112	61	
	7	(untitled)	Single	1, 4, 3, 5, 6	16, 40, 64, 92, 113	65	
	8	(untitled)	Single	1, 4, 3, 6, 5	28, 48, 71, 85, 103	60	
	9	(untitled)	Single	1, 4, 5, 3, 6	17, 42, 68, 89, 113	63	
	10	(untitled)	Single	1, 4, 5, 6, 3	17, 41, 67, 88, 112	64	

Intergreen Matrix for Controller Stream 1

		To											
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
From	**A**			5	5		7	7		6			0
	B			5	9	6		5		6	10	0	
	C	8	5			5	5	5	7	12	6		
	D	5	5			5	8	5			6	10	0
	E		7	8	5			5			0	6	
	F	7		7	5			6	8	0		6	11
	G	5	8	7	8	9	5				0	0	6
	H			5			5			10			6
	I	4	4	4			4		4				
	J		5	5	5	5		5					
	K		4		4	4	4	4					
	L	5			5		5	5	5				

Banned Stage transitions for Controller Stream 1

		To					
		1	2	3	4	5	6
From	1						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	2	3	4	5	6
From	1	0	6	9	8	11	7
	2	7	0	8	8	11	7
	3	8	8	0	7	12	8
	4	8	9	8	0	10	9
	5	5	5	5	5	0	5
	6	7	7	8	7	6	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	B,F	108	28	40	1	5
	2	✓	4	H,G	36	48	12	1	5
	3	✓	3	C,D	56	71	15	1	5
	4	✓	6	E,A	79	85	6	1	5
	5	✓	5	I,L,J,K	91	103	12	1	5

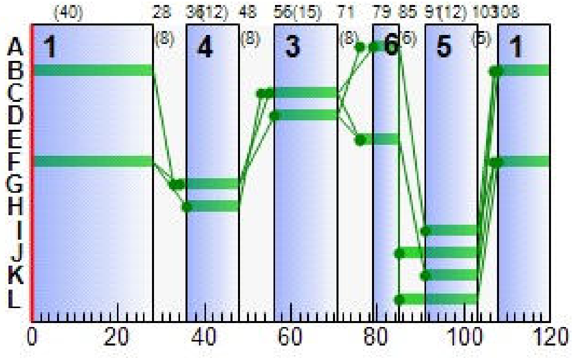
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	79	85	6
	B	1	✓	108	28	40
	C	1	✓	55	71	16
	D	1	✓	56	71	15
	E	1	✓	76	85	9
	F	1	✓	108	28	40
	G	1	✓	34	48	14
	H	1	✓	36	48	12
	I	1	✓	91	103	12
	J	1	✓	85	103	18
	K	1	✓	91	103	12
	L	1	✓	85	103	18

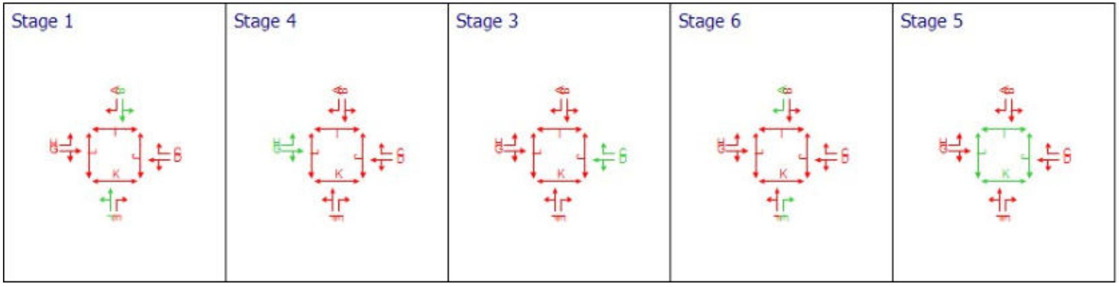
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	**1**	1	1	D	56	71	15
A	**2**	1	1	C	55	71	16
B	**1**	1	1	F	108	28	40
B	**2**	1	1	E	76	85	9
C	**1**	1	1	H	36	48	12
C	**2**	1	1	G	34	48	14
D	**1**	1	1	B	108	28	40
D	**2**	1	1	A	79	85	6

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	D	252 <	1800	15	0.00	105	-5	214.37	206.75	200.86	18.94 +
	2		1	1	C	9	1800	16	16.00	4	2733	52.17	44.89	85.06	0.26
Ax	**1**	(untitled)				366	Unrestricted	120	12.00	0	Unrestricted	24.44	0.00	0.00	0.00
B	**1**	(untitled)	1	1	F	505 <	1800	40	0.00	82	22	60.66	48.97	99.93	17.09 +
	2		1	1	E	110	1800	9	0.00	73	36	96.47	84.18	120.16	4.51
Bx	**1**	(untitled)				387	Unrestricted	120	51.00	0	Unrestricted	27.98	0.00	0.00	0.00
C	**1**	(untitled)	1	1	H	22	1800	12	11.00	11	786	57.14	49.54	89.99	0.67
	2		1	1	G	218 <	1800	14	0.00	97	3	148.65	141.06	159.89	12.58 +
Cx	**1**	(untitled)				243	Unrestricted	120	38.00	0	Unrestricted	12.08	0.00	0.00	0.00
	2					243	Unrestricted	120	38.00	0	Unrestricted	12.07	0.00	0.00	0.00
D	**1**	(untitled)	1	1	B	425 <	1800	40	0.00	69	45	47.52	40.49	89.74	12.92 +
	2		1	1	A	10	1800	6	6.00	10	950	62.46	55.48	94.68	0.32
Dx	**1**	(untitled)				300	Unrestricted	120	46.00	0	Unrestricted	24.88	0.00	0.00	0.00
9	**1**		1			120	1800	120	27.00	7	1400	8.65	0.07	0.00	0.00
	2		1			120	1800	120	27.00	7	1400	8.65	0.07	0.00	0.00
10	**1**		1			615	1800	120	2.00	34	193	6.11	0.52	0.00	0.09
11	**1**		1			261	1800	120	119.00	15	590	6.90	0.17	0.00	0.01
12	**1**		1			435	1800	120	24.00	24	314	8.22	0.32	0.00	0.04
13	**1**					486	Unrestricted	120	38.00	0	Unrestricted	14.70	0.00	0.00	0.00

Network Results

	Distance travelled (PCU-km/hr)	**Time spent (PCU-hr/hr)**	**Mean journey speed (kph)**	**Uniform delay (PCU-hr/hr)**	**Random plus oversat delay (PCU-hr/hr)**	**Weighted cost of delay (£ per hr)**	**Weighted cost of stops (£ per hr)**	**Excess queue penalty (£ per hr)**	**Performance Index (£ per hr)**
Normal traffic	542.09	56.02	9.68	17.92	20.03	538.90	23.64	0.00	562.54
Bus									
Tram									
Pedestrians	20.40	35.52	0.57	31.52	0.00	447.54	0.00	0.00	447.54
TOTAL	562.49	91.54	6.14	49.44	20.03	986.43	23.64	0.00	1010.08

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 1 - 2040 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 1\Upgraded Layout
Report generation date: 28/04/2022 02:27:15

Summary of network performance

	PM			
	PI (£ per hr)	**Total delay (PCU-hr/hr)**	**Highest DOS**	**Number oversaturated**
	Junction 1 [A2] - 2040 "with development"			
Network	823.24	56.64	94% (TS A/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

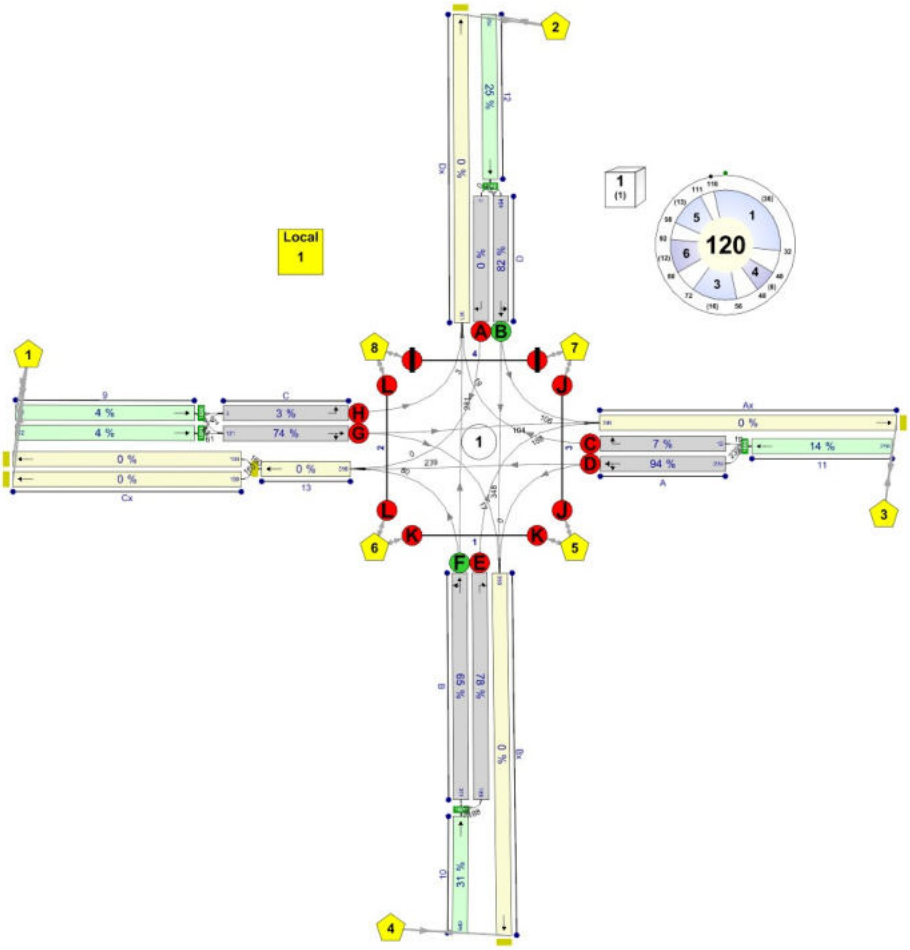
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 1 [A2]
D1 - 2040 "with development", PM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Arm Data	Arm 13	No traffic node specified for arm(s): 13

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 02:24:59	28/04/2022 02:25:04	5.57	17:00	120	823.24	56.64	94.12	A/1	0	0	A/1	10/1

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Junction 1 [A2]			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1
11			1
12			1
13			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	63.49	✓	Sum of lanes	1800	✓		Normal	
	2			✓	60.67	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	203.69						Normal	
B	1	(untitled)		✓	97.37	✓	Sum of lanes	1800	✓		Normal	
	2			✓	102.39	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	233.18						Normal	
C	1	(untitled)		✓	63.36	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.22	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	100.70						Normal	
	2			✓	100.58						Normal	
D	1	(untitled)		✓	58.52	✓	Sum of lanes	1800	✓		Normal	
	2			✓	58.16	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	207.29						Normal	
9	1			✓	71.45	✓	Sum of lanes	1800			Normal	
	2			✓	71.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.60	✓	Sum of lanes	1800			Normal	
11	1			✓	56.09	✓	Sum of lanes	1800			Normal	
12	1			✓	65.81	✓	Sum of lanes	1800			Normal	
13	1			✓	122.47						Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
Ax	1	1	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
Cx	1	1	(untitled)			
	2	1	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
11	1	1	(untitled)			1800
12	1	1	(untitled)			1800
13	1	1	(untitled)			

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	239	239
	2	19	19
Ax	1	398	398
B	1	361	361
	2	188	188
Bx	1	365	365
C	1	3	3
	2	121	121
Cx	1	160	160
	2	160	160
D	1	454	454
	2	0	0
Dx	1	303	303
9	1	62	62
	2	62	62
10	1	549	549
11	1	258	258
12	1	454	454
13	1	319	319

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	D	
	2	1	C	
B	1	1	F	
	2	1	E	
C	1	1	H	
	2	1	G	
D	1	1	B	
	2	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
9	1	8.57	30.00
	2	8.57	30.00
10	1	5.59	30.00
11	1	6.73	30.00
12	1	7.90	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	11/1	A/1	7.62	30.00	✓	Straight	Straight Movement
	2	**1**	11/1	A/2	7.28	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	B/2	Ax/1	24.44	30.00	✓	Offside	47.99
B	**1**	**1**	10/1	B/1	11.68	30.00	✓	Straight	Straight Movement
	2	**1**	10/1	B/2	12.29	30.00	✓	Straight	Straight Movement
Bx	**1**	**1**	C/2	Bx/1	27.98	30.00	✓	Offside	56.60
C	**1**	**1**	9/2	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	C/2	7.59	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	13/1	Cx/1	12.08	30.00	✓	Straight	Straight Movement
	2	**1**	13/1	Cx/2	12.07	30.00	✓	Straight	Straight Movement
D	**1**	**1**	12/1	D/1	7.02	30.00	✓	Straight	Straight Movement
	2	**1**	12/1	D/2	6.98	30.00	✓	Straight	Straight Movement
Dx	**1**	**1**	B/1	Dx/1	24.88	30.00	✓	Straight	Straight Movement
13	**1**	**1**	B/1	13/1	14.70	30.00	✓	Nearside	41.84
Ax	**1**	**2**	D/1	Ax/1	24.44	30.00	✓	Nearside	39.46
Bx	**1**	**2**	D/1	Bx/1	27.98	30.00	✓	Straight	Straight Movement
C	**1**	**2**	9/1	C/1	7.60	30.00	✓	Straight	Straight Movement
	2	**2**	9/1	C/2	7.59	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	24.88	30.00	✓	Nearside	36.02
13	**1**	**2**	D/2	13/1	14.70	30.00	✓	Offside	52.19
Ax	**1**	**3**	C/2	Ax/1	24.44	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	A/1	Bx/1	27.98	30.00	✓	Nearside	40.20
Dx	**1**	**3**	A/2	Dx/1	24.88	30.00	✓	Offside	48.68
13	**1**	**3**	A/1	13/1	14.70	30.00	✓	Straight	Straight Movement

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	K	
2	1	L	
3	1	J	
4	1	I	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	3	104	17	0	0	0	0
	2	0	0	106	348	0	0	0	0
	3	239	19	0	0	0	0	0	0
	4	80	281	188	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	9/2, 9/1	Cx/2, Cx/1	#0000FF
	2	(untitled)	12/1	Dx/1	#FF0000
	3	(untitled)	11/1	Ax/1	#00FF00
	4	(untitled)	10/1	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		4	3	10/1, B/2, Ax/1	Normal	188
	10		4	2	10/1, B/1, Dx/1	Normal	281
	11		4	1	10/1, B/1, 13/1, Cx/1	Normal	40
	12		4	1	10/1, B/1, 13/1, Cx/2	Normal	40
	13		1	2	9/2, C/1, Dx/1	Normal	2
	14		1	2	9/1, C/1, Dx/1	Normal	2
	16		1	4	9/2, C/2, Bx/1	Normal	9
	19		2	1	12/1, D/2, 13/1, Cx/1	Normal	0
	20		2	1	12/1, D/2, 13/1, Cx/2	Normal	0
	21		2	4	12/1, D/1, Bx/1	Normal	348
	24		3	1	11/1, A/1, 13/1, Cx/1	Normal	120
	25		3	1	11/1, A/1, 13/1, Cx/2	Normal	120
	26		3	4	11/1, A/1, Bx/1	Normal	0
	44		1	4	9/1, C/2, Bx/1	Normal	9
	45		2	3	12/1, D/1, Ax/1	Normal	106
	46		3	2	11/1, A/2, Dx/1	Normal	19
	47		1	3	9/2, C/2, Ax/1	Normal	52
	48		1	3	9/1, C/2, Ax/1	Normal	52

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		8	NetworkDefault	120	60

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	A	(untitled)	5	300	0	0	Unknown	
	B	(untitled)	5	300	0	0	Unknown	
	C	(untitled)	5	17	0	0	Unknown	
	D	(untitled)	5	17	0	0	Unknown	
	E	(untitled)	5	300	0	0	Unknown	
	F	(untitled)	5	300	0	0	Unknown	
	G	(untitled)	5	300	0	0	Unknown	
	H	(untitled)	5	300	0	0	Unknown	
	I	(untitled)	5	300	0	0	Pedestrian	0
	J	(untitled)	5	300	0	0	Pedestrian	0
	K	(untitled)	5	300	0	0	Pedestrian	0
	L	(untitled)	5	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	B, F	1	1	100
	2	F, E	1	1	100
	3	C, D	1	1	100
	4	H, G	1	1	100
	5	I, L, J, K	1	1	100
	6	E, A	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 3, 4, 5, 6	17, 43, 66, 92, 113	63	
	2	(untitled)	Single	1, 3, 4, 6, 5	17, 43, 67, 93, 115	61	
	3	(untitled)	Single	1, 3, 5, 4, 6	16, 41, 69, 89, 113	67	
	4	(untitled)	Single	1, 3, 5, 6, 4	16, 41, 69, 90, 112	66	
	5	(untitled)	Single	1, 3, 6, 4, 5	17, 42, 66, 89, 115	64	
	6	(untitled)	Single	1, 3, 6, 5, 4	17, 43, 68, 91, 112	61	
	7	(untitled)	Single	1, 4, 3, 5, 6	16, 40, 64, 92, 113	65	
	8	(untitled)	Single	1, 4, 3, 6, 5	32, 48, 72, 92, 111	60	
	9	(untitled)	Single	1, 4, 5, 3, 6	17, 42, 68, 89, 113	63	
	10	(untitled)	Single	1, 4, 5, 6, 3	17, 41, 67, 88, 112	64	

Intergreen Matrix for Controller Stream 1

		To											
		A	B	C	D	E	F	G	H	I	J	K	L
From	A			5	5		7	7		6			0
	B			5	9	6		5		6	10	0	
	C	8	5			5	5	5	7	12	6		
	D	5	5			5	8	5			6	10	0
	E		7	8	5			5			0	6	
	F	7		7	5			6	8	0		6	11
	G	5	8	7	8	9	5				0	0	6
	H			5			5			10			6
	I	4	4	4			4		4				
	J		5	5	5	5		5					
	K		4		4	4	4	4					
	L	5			5		5	5	5				

Banned Stage transitions for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	9	8	11	7
	2	7	0	8	8	11	7
	3	8	8	0	7	12	8
	4	8	9	8	0	10	9
	5	5	5	5	5	0	5
	6	7	7	8	7	6	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	B,F	116	32	36	1	5
	2	✓	4	H,G	40	48	8	1	5
	3	✓	3	C,D	56	72	16	1	5
	4	✓	6	E,A	80	92	12	1	5
	5	✓	5	I,L,J,K	98	111	13	1	5

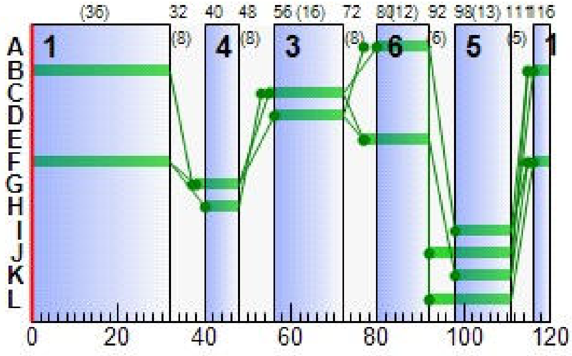
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	80	92	12
	B	**1**	✓	116	32	36
	C	**1**	✓	55	72	17
	D	**1**	✓	56	72	16
	E	**1**	✓	77	92	15
	F	**1**	✓	116	32	36
	G	**1**	✓	38	48	10
	H	**1**	✓	40	48	8
	I	**1**	✓	98	111	13
	J	**1**	✓	92	111	19
	K	**1**	✓	98	111	13
	L	**1**	✓	92	111	19

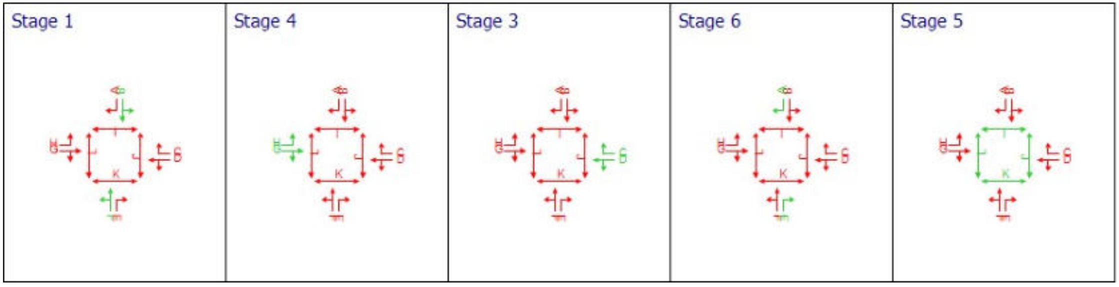
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	**1**	1	1	D	56	72	16
A	**2**	1	1	C	55	72	17
B	**1**	1	1	F	116	32	36
B	**2**	1	1	E	77	92	15
C	**1**	1	1	H	40	48	8
C	**2**	1	1	G	38	48	10
D	**1**	1	1	B	116	32	36
D	**2**	1	1	A	80	92	12

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

			SIGNALS			FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1	(untitled)	1	1	D	240 <	1800	16	0.00	94	6	124.67	117.05	145.41	12.27 +
	2		1	1	C	19	1800	17	16.00	7	1321	51.63	44.35	85.26	0.55
Ax	1	(untitled)				398	Unrestricted	120	13.00	0	Unrestricted	24.44	0.00	0.00	0.00
B	1	(untitled)	1	1	F	361	1800	36	0.00	65	54	53.55	41.87	89.60	10.93
	2		1	1	E	188	1800	15	0.00	78	28	87.71	75.43	115.18	7.37
Bx	1	(untitled)				366	Unrestricted	120	57.00	0	Unrestricted	27.98	0.00	0.00	0.00
C	1	(untitled)	1	1	H	4	1800	8	8.00	3	3275	59.81	52.21	91.85	0.12
	2		1	1	G	122	1800	10	0.00	74	35	89.37	81.78	118.21	4.90
Cx	1	(untitled)				160	Unrestricted	120	57.00	0	Unrestricted	12.08	0.00	0.00	0.00
	2					160	Unrestricted	120	57.00	0	Unrestricted	12.07	0.00	0.00	0.00
D	1	(untitled)	1	1	B	454 <	1800	36	0.00	82	22	59.28	52.26	101.72	15.62 +
	2		1	1	A	0	1800	12	13.00	0	Unrestricted	0.00	0.00	0.00	0.00
Dx	1	(untitled)				304	Unrestricted	120	53.00	0	Unrestricted	24.88	0.00	0.00	0.00
9	1		1			63	1800	120	0.00	4	2757	8.61	0.04	0.00	0.00
	2		1			63	1800	120	0.00	4	2757	8.61	0.04	0.00	0.00
10	1		1			549	1800	120	0.00	31	228	6.03	0.44	0.00	0.07
11	1		1			259	1800	120	19.00	14	595	6.90	0.17	0.00	0.01
12	1		1			454	1800	120	44.00	25	296	8.23	0.34	0.00	0.04
13	1					320	Unrestricted	120	51.00	0	Unrestricted	14.70	0.00	0.00	0.00

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	485.14	41.89	11.58	16.56	9.16	365.19	18.99	0.00	384.18
Bus									
Tram									
Pedestrians	20.40	34.92	0.58	30.92	0.00	439.06	0.00	0.00	439.06
TOTAL	505.54	76.81	6.58	47.48	9.16	804.24	18.99	0.00	823.24

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 2 - 2028 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 2\Upgraded Layout
Report generation date: 28/04/2022 03:22:15

Summary of network performance

	AM			
	PI (£ per hr)	**Total delay (PCU-hr/hr)**	**Highest DOS**	**Number oversaturated**
	Junction 2 - 2028 "with development"			
Network	1435.67	98.24	82% (TS B/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

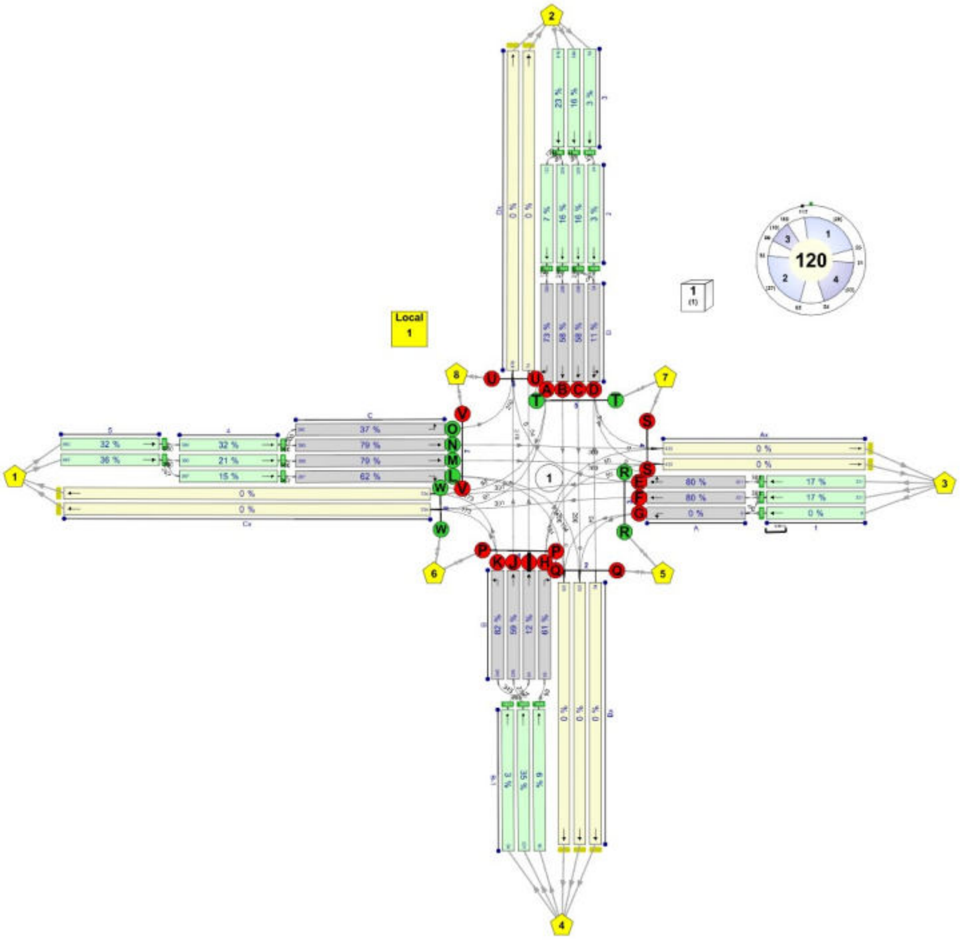
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 2
D1 - 2028 "with development", AM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Traffic Stream Flows	Arm 1 - Traffic Stream 4 (Bus) - Flows (08:00-09:00)	Traffic Stream 1/4 has no paths passing through it, so will not be assigned any flows.

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 03:21:57	28/04/2022 03:22:06	9.74	08:00	120	1435.67	98.24	82.38	B/1	0	0	B/1	5/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 2			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development"	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
1	(untitled)		1
B-1	(untitled)		1
2	(untitled)		1
3	(untitled)		1
4	(untitled)		1
5	(untitled)		1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	30.67	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	93.88						Normal	
	2	(untitled)		✓	93.94						Normal	
B	1	(untitled)		✓	37.78	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	35.22	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	36.96	✓	Sum of lanes	1800	✓		Bus	
	4	(untitled)		✓	34.84	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	115.03						Bus	
	2	(untitled)		✓	107.54						Normal	
	3	(untitled)		✓	107.49						Normal	
C	1	(untitled)		✓	43.30	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	41.51	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	41.53	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	41.55	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	134.35						Normal	
	2	(untitled)		✓	134.34						Normal	
D	1	(untitled)		✓	30.45	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	121.45						Normal	
	2	(untitled)		✓	129.15						Bus	
1	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Bus	
B-1	2			✓	35.10	✓	Sum of lanes	1800			Bus	
	3			✓	35.10	✓	Sum of lanes	1800			Normal	
	4			✓	35.10	✓	Sum of lanes	1800			Normal	
2	2			✓	29.00	✓	Sum of lanes	1800			Normal	
	3			✓	29.00	✓	Sum of lanes	1800			Normal	
	4			✓	30.01	✓	Sum of lanes	1800			Normal	
	5			✓	29.00	✓	Sum of lanes	1800			Bus	
3	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	6			✓	24.40	✓	Sum of lanes	1800			Bus	
4	2			✓	29.47	✓	Sum of lanes	1800			Normal	
	3			✓	31.40	✓	Sum of lanes	1800			Normal	
	5			✓	29.47	✓	Sum of lanes	1800			Normal	
5	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	**1**	**2**	(untitled)			1800
	2	**1**	(untitled)			1800
	3	**3**	(untitled)			1800
Ax	**1**	**2**	(untitled)			
	2	**1**	(untitled)			
B	**1**	**2**	(untitled)			1800
	2	**4**	(untitled)			1800
	3	**3**	(untitled)			1800
	4	**1**	(untitled)			1800
Bx	**1**	**3**	(untitled)			
	2	**1**	(untitled)			
	3	**2**	(untitled)			
C	**1**	**4**	(untitled)			1800
	2	**1**	(untitled)			1800
	3	**3**	(untitled)			1800
	4	**2**	(untitled)			1800
Cx	**1**	**1**	(untitled)			
	2	**2**	(untitled)			
D	**1**	**5**	(untitled)			1800
	2	**2**	(untitled)			1800
	3	**4**	(untitled)			1800
	4	**3**	(untitled)			1800
Dx	**1**	**1**	(untitled)			
	2	**2**	(untitled)			
1	**2**	**1**	(untitled)			1800
	3	**1**	(untitled)			1800
	4	**1**	(untitled)			1800
B-1	**2**	**2**	(untitled)			1800
	3	**3**	(untitled)			1800
	4	**1**	(untitled)			1800
2	**2**	**1**	(untitled)			1800
	3	**1**	(untitled)			1800
	4	**1**	(untitled)			1800
	5	**1**	(untitled)			1800
3	**2**	**1**	(untitled)			1800
	3	**1**	(untitled)			1800
	6	**1**	(untitled)			1800
4	**2**	**1**	(untitled)			1800
	3	**1**	(untitled)			1800
	5	**1**	(untitled)			1800
5	**2**	**1**	(untitled)			1800
	4	**1**	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	**(ALL)**	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Bus - Modelling

Arm	Traffic Stream	Stationary time (seconds)	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	0.00	100	100

Bus - Advanced

Arm	Traffic Stream	Dispersion type	Use network default acceleration
(ALL)	**(ALL)**	NetworkDefault	✓

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)	Bus Flow (PCU/hr)
A	1	0	0	0
	2	301	301	
	3	301	301	
Ax	1	430	430	
	2	430	430	
B	1	345	345	
	2	276	276	
	3	54		54
	4	99	99	
Bx	1	54		54
	2	429	429	
	3	429	429	
C	1	200	200	
	2	380	380	
	3	380	380	
	4	267	267	
Cx	1	534	534	
	2	534	534	
D	1	54	0	54
	2	296	296	
	3	296	296	
	4	120	120	
Dx	1	476	476	
	2	54		54
1	2	301	301	
	3	301	301	
	4	0		0
B-1	2	54		54
	3	621	621	
	4	99	99	
2	2	296	296	
	3	296	296	
	4	120	120	
	5	54		54
3	2	296	296	
	3	416	416	
	6	54		54
4	2	380	380	
	3	267	267	
	5	580	580	
5	2	647	647	
	4	580	580	

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	G	
	2	1	F	
	3	1	E	
B	1	1	K	
	2	1	J	
	3	1	I	
	4	1	H	
C	1	1	O	
	2	1	N	
	3	1	M	
	4	1	L	
D	1	1	D	
	2	1	C	
	3	1	B	
	4	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)
1	2	2.93	30.00	
	3	2.93	30.00	
	4			15.00
B-1	2			15.00
	3	4.21	30.00	
	4	4.21	30.00	
3	2	2.93	30.00	
	3	2.93	30.00	
	6			15.00
5	2	2.93	30.00	
	4	2.93	30.00	

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	1/4	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
	2	1	1/2	A/2	3.58	30.00		✓	Straight	Straight Movement
	3	1	1/3	A/3	3.58	30.00		✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	11.27	30.00		✓	Nearside	16.65
	2	1	D/1	Ax/2	11.27	30.00		✓	Nearside	17.23
B	1	1	B-1/3	B/1	4.53	30.00		✓	Straight	Straight Movement
	2	1	B-1/3	B/2	4.23	30.00		✓	Straight	Straight Movement
	3	1	B-1/2	B/3			15.00	✓	Straight	Straight Movement
	4	1	B-1/4	B/4	4.18	30.00		✓	Straight	Straight Movement
Bx	1	1	D/1	Bx/1			15.00	✓	Straight	Straight Movement
	2	1	C/4	Bx/2	12.91	30.00		✓	Offside	26.45
	3	1	C/4	Bx/3	12.90	30.00		✓	Offside	26.45
	1	1	4/5	C/1	5.20	30.00		✓	Straight	Straight Movement

C	**2**	**1**	4/5	C/2	4.98	30.00		✓	Straight	Straight Movement
	3	**1**	4/2	C/3	4.98	30.00		✓	Straight	Straight Movement
	4	**1**	4/3	C/4	4.99	30.00		✓	Straight	Straight Movement
Cx	**1**	**1**	A/2	Cx/1	16.12	30.00		✓	Straight	Straight Movement
	2	**1**	A/3	Cx/2	16.12	30.00		✓	Straight	Straight Movement
D	**1**	**1**	2/5	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
	2	**1**	2/2	D/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	2/3	D/3	3.54	30.00		✓	Straight	Straight Movement
	4	**1**	2/4	D/4	3.54	30.00		✓	Straight	Straight Movement
Dx	**1**	**1**	B/2	Dx/1	14.57	30.00		✓	Straight	Straight Movement
	2	**1**	B/3	Dx/2			15.00	✓	Straight	Straight Movement
2	**2**	**1**	3/2	2/2	3.48	30.00		✓	Straight	Straight Movement
	3	**1**	3/3	2/3	3.48	30.00		✓	Straight	Straight Movement
	4	**1**	3/3	2/4	3.60	30.00		✓	Straight	Straight Movement
	5	**1**	3/6	2/5			15.00	✓	Straight	Straight Movement
4	**2**	**1**	5/2	4/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	5/2	4/3	3.77	30.00		✓	Straight	Straight Movement
	5	**1**	5/4	4/5	3.54	30.00		✓	Straight	Straight Movement
A	**1**	**2**	1/2	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
Ax	**1**	**2**	C/2	Ax/1	11.27	30.00		✓	Straight	Straight Movement
	2	**2**	C/3	Ax/2	11.27	30.00		✓	Straight	Straight Movement
Bx	**2**	**2**	D/2	Bx/2	12.91	30.00		✓	Straight	Straight Movement
	3	**2**	D/3	Bx/3	12.90	30.00		✓	Straight	Straight Movement
Cx	**1**	**2**	B/1	Cx/1	16.12	30.00		✓	Nearside	15.08
	2	**2**	B/1	Cx/2	16.12	30.00		✓	Nearside	16.75
D	**1**	**2**	2/2	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	14.57	30.00		✓	Nearside	14.66
Ax	**1**	**3**	B/4	Ax/1	11.27	30.00		✓	Offside	29.45
	2	**3**	B/4	Ax/2	11.27	30.00		✓	Offside	26.33
Bx	**2**	**3**	A/1	Bx/2	12.91	30.00		✓	Nearside	16.74
	3	**3**	A/1	Bx/3	12.90	30.00		✓	Nearside	17.18
Cx	**1**	**3**	D/4	Cx/1	16.12	30.00		✓	Offside	28.88
	2	**3**	D/4	Cx/2	16.12	30.00		✓	Offside	27.91
Dx	**1**	**3**	A/3	Dx/1	14.57	30.00		✓	Offside	27.77

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40
5	(untitled)				Farside	3.00	2.00	5.40
6	(untitled)				Farside	3.00	2.00	5.40
7	(untitled)				Farside	3.00	2.00	5.40
8	(untitled)				Farside	3.00	2.00	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	P	
2	1	Q	
3	1	R	
4	1	S	
5	1	T	
6	1	U	
7	1	V	
8	1	W	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Pedestrian Crossing Connectors

Pedestrian Crossing Connectors

Pedestrian crossing connector	Pedestrian crossing1	Pedestrian crossing2	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	2:1	1:1	3.00	2.00	5.40
2	4:1	3:1	3.00	2.00	5.40
3	6:1	5:2	3.00	2.00	5.40
4	8:1	7:2	3.00	2.00	5.40

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
From		1	2	3	4	5	6	7	8
	1	0	200	760	267	0	0	0	0
	2	120	0	0	591	0	0	0	0
	3	602	0	0	0	0	0	0	0
	4	345	276	99	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows (PCU/hr)

		To							
From		1	2	3	4	5	6	7	8
	1	0	0	0	0	0	0	0	0
	2	0	0	0	54	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	54	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
From		1	2	3	4	5	6	7	8
	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	5/4, 5/2	Cx/1, Cx/2	#0000FF
	2	(untitled)	3/6, 3/2, 3/3	Dx/2, Dx/1	#FF0000
	3	(untitled)	1/4, 1/2, 1/3	Ax/1, Ax/2	#00FF00
	4	(untitled)	B-1/4, B-1/3, B-1/2	Bx/3, Bx/2, Bx/1	#FFFF00
	5	(untitled)	2:2E, 3:2E	2:2X, 3:2X	#FF00FF
	6	(untitled)	1:2E, 8:2E	1:2X, 8:2X	#008000
	7	(untitled)	4:2E, 5:1E	4:2X, 5:1X	#FFA500
	8	(untitled)	6:2E, 7:1E	6:2X, 7:1X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**4**		1	4	5/2, 4/3, C/4, Bx/3	Normal	134
	6		1	4	5/2, 4/3, C/4, Bx/2	Normal	134
	8		1	2	5/4, 4/5, C/1, Dx/1	Normal	200
	10		2	4	3/3, 2/3, D/3, Bx/3	Normal	296
	11		2	4	3/2, 2/2, D/2, Bx/2	Normal	296
	14		3	2	1/3, A/3, Dx/1	Normal	0
	26		2	3	3/2, 2/2, D/1, Ax/1	Normal	0
	27		2	3	3/2, 2/2, D/1, Ax/2	Normal	0
	28		1	3	5/4, 4/5, C/2, Ax/1	Normal	380
	29		1	3	5/2, 4/2, C/3, Ax/2	Normal	380
	30		4	3	B-1/4, B/4, Ax/2	Normal	50
	31		4	3	B-1/4, B/4, Ax/1	Normal	50
	33		3	1	1/3, A/3, Cx/2	Normal	301
	34		3	1	1/2, A/2, Cx/1	Normal	301
	35		4	1	B-1/3, B/1, Cx/1	Normal	173
	36		4	1	B-1/3, B/1, Cx/2	Normal	173
	37		2	1	3/3, 2/4, D/4, Cx/2	Normal	60
	38		2	1	3/3, 2/4, D/4, Cx/1	Normal	60
	40		3	4	1/2, A/1, Bx/2	Normal	0
	41		3	4	1/2, A/1, Bx/3	Normal	0
	42		4	2	B-1/3, B/2, Dx/1	Normal	276

Bus Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Bus Calculated Flow (PCU/hr)
1	**12**		2	4	3/6, 2/5, D/1, Bx/1	Normal	54
	39		4	2	B-1/2, B/3, Dx/2	Normal	54

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**18**		5	6	2:2E, 2:1X, 1:1E, 1:2X	Normal	300
	19		6	5	1:2E, 1:1X, 2:1E, 2:2X	Normal	300
	20		5	7	3:2E, 3:1X, 4:1E, 4:2X	Normal	300
	21		7	5	4:2E, 4:1X, 3:1E, 3:2X	Normal	300
	22		8	7	6:2E, 6:1X, 5:2E, 5:1X	Normal	300
	23		7	8	5:1E, 5:2X, 6:1E, 6:2X	Normal	300
	24		8	6	7:1E, 7:2X, 8:1E, 8:2X	Normal	300
	25		6	8	8:2E, 8:1X, 7:2E, 7:1X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		5	NetworkDefault	120	59

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	**A**	(untitled)	7	300	0	0	Unknown	
	B	(untitled)	7	300	0	0	Unknown	
	C	(untitled)	7	300	0	0	Unknown	
	D	(untitled)	7	300	0	0	Unknown	
	E	(untitled)	7	300	0	0	Unknown	
	F	(untitled)	7	300	0	0	Unknown	
	G	(untitled)	7	300	0	0	Unknown	
	H	(untitled)	7	300	0	0	Unknown	
	I	(untitled)	7	300	0	0	Unknown	
	J	(untitled)	7	300	0	0	Unknown	
	K	(untitled)	7	300	0	0	Unknown	
	L	(untitled)	7	300	0	0	Unknown	
	M	(untitled)	7	300	0	0	Unknown	
	N	(untitled)	7	300	0	0	Unknown	
	O	(untitled)	7	300	0	0	Unknown	
	P	(untitled)	7	300	0	0	Pedestrian	0
	Q	(untitled)	7	300	0	0	Pedestrian	0
	R	(untitled)	7	300	0	0	Pedestrian	0
	S	(untitled)	7	300	0	0	Pedestrian	0
	T	(untitled)	7	300	0	0	Pedestrian	0
	U	(untitled)	7	300	0	0	Pedestrian	0
	V	(untitled)	7	300	0	0	Pedestrian	0
	W	(untitled)	7	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	O, N, M, L, W, T, R	1	1	100
	2	I, J, K, B, C, D, V, R	1	1	100
	3	A, H, Q, U, R, V	1	1	100
	4	E, F, G, P, V, T, S	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 2, 3, 4	16, 44, 66, 89	66	
	2	(untitled)	Single	1, 2, 4, 3	15, 42, 68, 92	68	
	3	(untitled)	Single	1, 3, 2, 4	15, 40, 64, 89	70	
	4	(untitled)	Single	1, 3, 4, 2	15, 40, 63, 89	68	
	5	(untitled)	Single	1, 4, 2, 3	25, 54, 92, 109	59	
	6	(untitled)	Single	1, 4, 3, 2	16, 38, 63, 89	63	

Intergreen Matrix for Controller Stream 1

		To																						
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
From	**A**					5	5			5	6	10	8	5	5						6			0
	B					6	7		7				5	5	5			0			6			
	C					6	7		5				5	5	5			0			6			
	D					7	8	11	5					5	5			0		11	6			
	E	8	5	5	5				5	7	8	11	7	5	6	11			6			0		0
	F	6	5	5	5				6	8	8	11	5						6					0
	G				5													9	6					
	H		5	5	10	8	5						5	5	5		6			0				
	I	7				5	5						5	6	7		6					0		
	J	5				5	5						6	7	8	11	6					0		
	K	5				5	5										6							10
	L	5	5	5		5	5		9	5	5							0					5	
	M	5	7	7	11	5			6	5	5									0			5	
	N	6	7	8	12	5			6	5	5									0			6	
	O					5					5											10	6	
	P								4	4	4	4												
	Q		5	5	5			5					5											
	R					5	5	5																
	S				4				4					4	4									
	T	1	1	1	1																			
	U					1				1	1					1								
	V												1	1	1	1								
	W	1				1	1					1												

Banned Stage transitions for Controller Stream 1

		To			
		1	**2**	**3**	**4**
From	**1**				
	2				
	3				
	4				

Interstage Matrix for Controller Stream 1

		To			
		1	**2**	**3**	**4**
From	**1**	0	12	10	6
	2	11	0	7	11
	3	8	10	0	8
	4	11	11	9	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	O,N,M,L,W,T,R	117	25	28	1	7
	2	✓	4	E,F,G,P,V,T,S	31	54	23	1	6
	3	✓	2	I,J,K,B,C,D,V,R	65	92	27	1	7
	4	✓	3	A,H,Q,U,R,V	99	109	10	1	7

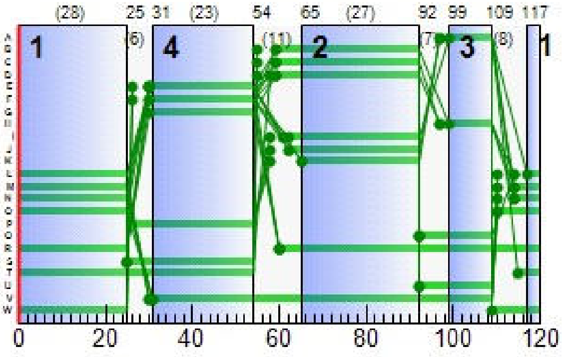
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	99	109	10
	B	1	✓	59	92	33
	C	1	✓	59	92	33
	D	1	✓	59	92	33
	E	1	✓	30	54	24
	F	1	✓	30	54	24
	G	1	✓	30	54	24
	H	1	✓	99	109	10
	I	1	✓	62	92	30
	J	1	✓	62	92	30
	K	1	✓	65	92	27
	L	1	✓	117	25	28
	M	1	✓	114	25	31
	N	1	✓	114	25	31
	O	1	✓	110	25	35
	P	1	✓	25	54	29
	Q	1	✓	92	109	17
	R	1	✓	60	25	85
	S	1	✓	25	54	29
	T	1	✓	115	54	59
	U	1	✓	92	109	17
	V	1	✓	31	109	78
	W	1	✓	109	25	36

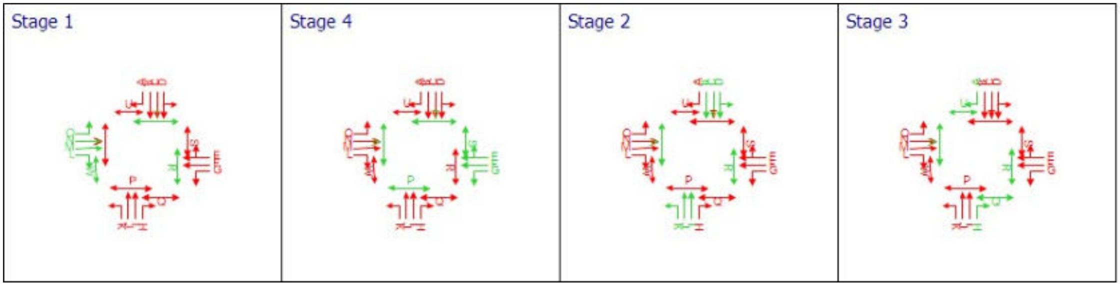
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	G	30	54	24
A	2	1	1	F	30	54	24
A	3	1	1	E	30	54	24
B	1	1	1	K	65	92	27
B	2	1	1	J	62	92	30
B	3	1	1	I	62	92	30
B	4	1	1	H	99	109	10
C	1	1	1	O	110	25	35
C	2	1	1	N	114	25	31
C	3	1	1	M	114	25	31
C	4	1	1	L	117	25	28
D	1	1	1	D	59	92	33
D	2	1	1	C	59	92	33
D	3	1	1	B	59	92	33
D	4	1	1	A	99	109	10

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1 NB**	(untitled)	1	1	G	0	1800	24	25.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	F	301 <	1800	24	0.00	80	12	67.10	63.52	108.04	11.07 +
	3	(untitled)	1	1	E	301 <	1800	24	0.00	80	12	67.10	63.52	108.04	11.07 +
Ax	**1**	(untitled)				430	Unrestricted	120	66.00	0	Unrestricted	11.27	0.00	0.00	0.00
	2	(untitled)				430	Unrestricted	120	66.00	0	Unrestricted	11.27	0.00	0.00	0.00
B	**1**	(untitled)	1	1	K	346 <	1800	27	0.00	82	9	66.91	62.37	108.07	12.66 +
	2	(untitled)	1	1	J	276 <	1800	30	0.00	59	52	48.80	44.58	90.56	8.48 +
	3 B	(untitled)	1	1	I	54	1800	30	28.00	12	675	43.43	34.56	75.82	1.37
	4	(untitled)	1	1	H	100	1800	10	0.00	61	49	72.87	68.69	107.93	3.65
Bx	**1 B**	(untitled)				54	Unrestricted	120	96.00	0	Unrestricted	27.61	0.00	0.00	0.00
	2	(untitled)				430	Unrestricted	120	47.00	0	Unrestricted	12.91	0.00	0.00	0.00
	3	(untitled)				430	Unrestricted	120	47.00	0	Unrestricted	12.90	0.00	0.00	0.00
C	**1**	(untitled)	1	1	O	200	1800	35	0.00	37	143	40.23	35.04	78.87	5.33
	2	(untitled)	1	1	N	380 <	1800	31	0.00	79	14	59.53	54.55	102.29	13.16 +
	3	(untitled)	1	1	M	380 <	1800	31	0.00	79	14	59.53	54.55	102.29	13.16 +
	4	(untitled)	1	1	L	268 <	1800	28	0.00	62	46	52.08	47.10	92.68	8.38 +
Cx	**1**	(untitled)				534	Unrestricted	120	31.00	0	Unrestricted	16.12	0.00	0.00	0.00
	2	(untitled)				534	Unrestricted	120	31.00	0	Unrestricted	16.12	0.00	0.00	0.00
D	**1 NB**	(untitled)	1	1	D	54	1800	33	31.00	11	750	39.53	32.22	73.24	1.33
	2	(untitled)	1	1	C	296 <	1800	33	0.00	58	55	45.26	41.72	87.93	8.78 +
	3	(untitled)	1	1	B	296 <	1800	33	0.00	58	55	45.26	41.72	87.93	8.78 +
	4	(untitled)	1	1	A	120	1800	10	0.00	73	24	83.72	80.18	117.06	4.77
Dx	**1**	(untitled)				476	Unrestricted	120	41.00	0	Unrestricted	14.57	0.00	0.00	0.00
	2 B	(untitled)				54	Unrestricted	120	93.00	0	Unrestricted	31.00	0.00	0.00	0.00
1	**2**		1			301	1800	120	71.00	17	438	3.13	0.20	0.00	0.02
	3		1			301	1800	120	71.00	17	438	3.13	0.20	0.00	0.02
	4 B		1			0	1800	120	120.00	0	Unrestricted	0.00	0.00	0.00	0.00
B-1	**2 B**		1			54	1800	120	120.00	3	2900	8.45	0.03	0.00	0.00
	3		1			622	1800	120	64.00	35	160	4.74	0.53	0.00	0.09
	4		1			100	1800	120	0.00	6	1520	4.27	0.06	0.00	0.00
2	**2**		1			296	1800	120	45.00	16	447	3.68	0.20	0.00	0.02
	3		1			296	1800	120	45.00	16	447	3.68	0.20	0.00	0.02
	4		1			120	1800	120	0.00	7	1250	3.67	0.07	0.00	0.00
	5 B		1			54	1800	120	120.00	3	2900	6.99	0.03	0.00	0.00
3	**2**		1			296	1800	120	0.00	16	447	3.12	0.20	0.00	0.02
	3		1			416	1800	120	0.00	23	289	3.23	0.30	0.00	0.03
	6 B		1			54	1800	120	120.00	3	2900	5.89	0.03	0.00	0.00
4	**2**		1			380	1800	120	57.00	21	326	3.80	0.27	0.00	0.03
	3		1			268	1800	120	16.00	15	504	3.94	0.17	0.00	0.01
	5		1			580	1800	120	57.00	32	179	4.01	0.48	0.00	0.08
5	**2**		1			648	1800	120	0.00	36	150	3.49	0.56	0.00	0.10
	4		1			580	1800	120	0.00	32	179	3.40	0.48	0.00	0.08

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	635.92	70.15	9.07	37.52	11.43	695.12	40.46	0.00	735.57
Bus	21.60	2.44	8.84	0.99	0.02	14.24	0.25	0.00	14.50
Tram									
Pedestrians	34.80	54.95	0.63	48.28	0.00	685.60	0.00	0.00	685.60
TOTAL	692.32	127.54	5.43	86.79	11.45	1394.96	40.71	0.00	1435.67

- *N = at least one source for this link/traffic stream carries normal traffic*
- *B = at least one source for this link/traffic stream carries Bus traffic*
- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 2 - 2028 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 2\Upgraded Layout
Report generation date: 28/04/2022 03:27:26

Summary of network performance

	PM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 2 - 2028 "with development"			
Network	1431.74	97.96	80% (TS B/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

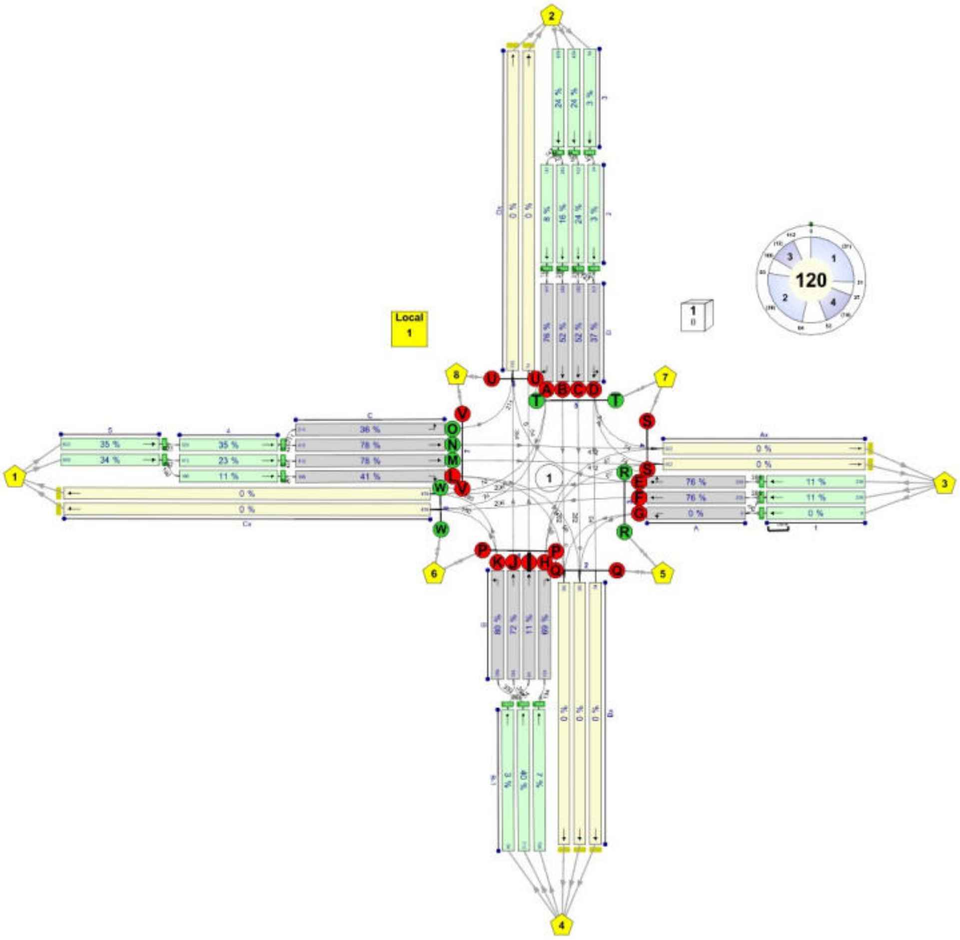
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 2
D1 - 2028 "with development", PM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Traffic Stream Flows	Arm 1 - Traffic Stream 4 (Bus) - Flows (17:00-18:00)	Traffic Stream 1/4 has no paths passing through it, so will not be assigned any flows.

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 03:27:09	28/04/2022 03:27:18	9.28	17:00	120	1431.74	97.96	80.00	B/1	0	0	B/1	B-1/3

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 2			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
1	(untitled)		1
B-1	(untitled)		1
2	(untitled)		1
3	(untitled)		1
4	(untitled)		1
5	(untitled)		1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	30.67	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	93.88						Normal	
	2	(untitled)		✓	93.94						Normal	
B	1	(untitled)		✓	37.78	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	35.22	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	36.96	✓	Sum of lanes	1800	✓		Bus	
	4	(untitled)		✓	34.84	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	115.03						Bus	
	2	(untitled)		✓	107.54						Normal	
	3	(untitled)		✓	107.49						Normal	
C	1	(untitled)		✓	43.30	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	41.51	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	41.53	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	41.55	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	134.35						Normal	
	2	(untitled)		✓	134.34						Normal	
D	1	(untitled)		✓	30.45	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	121.45						Normal	
	2	(untitled)		✓	129.15						Bus	
1	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Bus	
B-1	2			✓	35.10	✓	Sum of lanes	1800			Bus	
	3			✓	35.10	✓	Sum of lanes	1800			Normal	
	4			✓	35.10	✓	Sum of lanes	1800			Normal	
2	2			✓	29.00	✓	Sum of lanes	1800			Normal	
	3			✓	29.00	✓	Sum of lanes	1800			Normal	
	4			✓	30.01	✓	Sum of lanes	1800			Normal	
	5			✓	29.00	✓	Sum of lanes	1800			Bus	
3	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	6			✓	24.40	✓	Sum of lanes	1800			Bus	
4	2			✓	29.47	✓	Sum of lanes	1800			Normal	
	3			✓	31.40	✓	Sum of lanes	1800			Normal	
	5			✓	29.47	✓	Sum of lanes	1800			Normal	
5	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	2	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
Ax	1	2	(untitled)			
	2	1	(untitled)			
B	1	2	(untitled)			1800
	2	4	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
Bx	1	3	(untitled)			
	2	1	(untitled)			
	3	2	(untitled)			
C	1	4	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
	4	2	(untitled)			1800
Cx	1	1	(untitled)			
	2	2	(untitled)			
D	1	5	(untitled)			1800
	2	2	(untitled)			1800
	3	4	(untitled)			1800
	4	3	(untitled)			1800
Dx	1	1	(untitled)			
	2	2	(untitled)			
1	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
B-1	2	2	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
2	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
	5	1	(untitled)			1800
3	2	1	(untitled)			1800
	3	1	(untitled)			1800
	6	1	(untitled)			1800
4	2	1	(untitled)			1800
	3	1	(untitled)			1800
	5	1	(untitled)			1800
5	2	1	(untitled)			1800
	4	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Bus - Modelling

Arm	Traffic Stream	Stationary time (seconds)	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	0.00	100	100

Bus - Advanced

Arm	Traffic Stream	Dispersion type	Use network default acceleration
(ALL)	**(ALL)**	NetworkDefault	✓

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)	Bus Flow (PCU/hr)
A	1	0	0	0
	2	206	206	
	3	206	206	
Ax	1	552	552	
	2	552	552	
B	1	359	359	
	2	354	354	
	3	54		54
	4	134	134	
Bx	1	54		54
	2	380	380	
	3	380	380	
C	1	211	211	
	2	412	412	
	3	412	412	
	4	196	196	
Cx	1	459	459	
	2	459	459	
D	1	201	147	54
	2	282	282	
	3	282	282	
	4	147	147	
Dx	1	565	565	
	2	54		54
1	2	206	206	
	3	206	206	
	4	0		0
B-1	2	54		54
	3	713	713	
	4	134	134	
2	2	429	429	
	3	282	282	
	4	147	147	
	5	54		54
3	2	429	429	
	3	429	429	
	6	54		54
4	2	412	412	
	3	196	196	
	5	623	623	
5	2	608	608	
	4	623	623	

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	G	
	2	1	F	
	3	1	E	
B	1	1	K	
	2	1	J	
	3	1	I	
	4	1	H	
C	1	1	O	
	2	1	N	
	3	1	M	
	4	1	L	
D	1	1	D	
	2	1	C	
	3	1	B	
	4	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)
1	2	2.93	30.00	
	3	2.93	30.00	
	4			15.00
B-1	2			15.00
	3	4.21	30.00	
	4	4.21	30.00	
3	2	2.93	30.00	
	3	2.93	30.00	
	6			15.00
5	2	2.93	30.00	
	4	2.93	30.00	

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	1/4	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
	2	1	1/2	A/2	3.58	30.00		✓	Straight	Straight Movement
	3	1	1/3	A/3	3.58	30.00		✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	11.27	30.00		✓	Nearside	16.65
	2	1	D/1	Ax/2	11.27	30.00		✓	Nearside	17.23
B	1	1	B-1/3	B/1	4.53	30.00		✓	Straight	Straight Movement
	2	1	B-1/3	B/2	4.23	30.00		✓	Straight	Straight Movement
	3	1	B-1/2	B/3			15.00	✓	Straight	Straight Movement
	4	1	B-1/4	B/4	4.18	30.00		✓	Straight	Straight Movement
Bx	1	1	D/1	Bx/1			15.00	✓	Straight	Straight Movement
	2	1	C/4	Bx/2	12.91	30.00		✓	Offside	26.45
	3	1	C/4	Bx/3	12.90	30.00		✓	Offside	26.45
	1	1	4/5	C/1	5.20	30.00		✓	Straight	Straight Movement

C	**2**	**1**	4/5	C/2	4.98	30.00		✓	Straight	Straight Movement
	3	**1**	4/2	C/3	4.98	30.00		✓	Straight	Straight Movement
	4	**1**	4/3	C/4	4.99	30.00		✓	Straight	Straight Movement
Cx	**1**	**1**	A/2	Cx/1	16.12	30.00		✓	Straight	Straight Movement
	2	**1**	A/3	Cx/2	16.12	30.00		✓	Straight	Straight Movement
D	**1**	**1**	2/5	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
	2	**1**	2/2	D/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	2/3	D/3	3.54	30.00		✓	Straight	Straight Movement
	4	**1**	2/4	D/4	3.54	30.00		✓	Straight	Straight Movement
Dx	**1**	**1**	B/2	Dx/1	14.57	30.00		✓	Straight	Straight Movement
	2	**1**	B/3	Dx/2			15.00	✓	Straight	Straight Movement
2	**2**	**1**	3/2	2/2	3.48	30.00		✓	Straight	Straight Movement
	3	**1**	3/3	2/3	3.48	30.00		✓	Straight	Straight Movement
	4	**1**	3/3	2/4	3.60	30.00		✓	Straight	Straight Movement
	5	**1**	3/6	2/5			15.00	✓	Straight	Straight Movement
4	**2**	**1**	5/2	4/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	5/2	4/3	3.77	30.00		✓	Straight	Straight Movement
	5	**1**	5/4	4/5	3.54	30.00		✓	Straight	Straight Movement
A	**1**	**2**	1/2	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
Ax	**1**	**2**	C/2	Ax/1	11.27	30.00		✓	Straight	Straight Movement
	2	**2**	C/3	Ax/2	11.27	30.00		✓	Straight	Straight Movement
Bx	**2**	**2**	D/2	Bx/2	12.91	30.00		✓	Straight	Straight Movement
	3	**2**	D/3	Bx/3	12.90	30.00		✓	Straight	Straight Movement
Cx	**1**	**2**	B/1	Cx/1	16.12	30.00		✓	Nearside	15.08
	2	**2**	B/1	Cx/2	16.12	30.00		✓	Nearside	16.75
D	**1**	**2**	2/2	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	14.57	30.00		✓	Nearside	14.66
Ax	**1**	**3**	B/4	Ax/1	11.27	30.00		✓	Offside	29.45
	2	**3**	B/4	Ax/2	11.27	30.00		✓	Offside	26.33
Bx	**2**	**3**	A/1	Bx/2	12.91	30.00		✓	Nearside	16.74
	3	**3**	A/1	Bx/3	12.90	30.00		✓	Nearside	17.18
Cx	**1**	**3**	D/4	Cx/1	16.12	30.00		✓	Offside	28.88
	2	**3**	D/4	Cx/2	16.12	30.00		✓	Offside	27.91
Dx	**1**	**3**	A/3	Dx/1	14.57	30.00		✓	Offside	27.77

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40
5	(untitled)				Farside	3.00	2.00	5.40
6	(untitled)				Farside	3.00	2.00	5.40
7	(untitled)				Farside	3.00	2.00	5.40
8	(untitled)				Farside	3.00	2.00	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	P	
2	1	Q	
3	1	R	
4	1	S	
5	1	T	
6	1	U	
7	1	V	
8	1	W	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Pedestrian Crossing Connectors

Pedestrian Crossing Connectors

Pedestrian crossing connector	Pedestrian crossing1	Pedestrian crossing2	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	2:1	1:1	3.00	2.00	5.40
2	4:1	3:1	3.00	2.00	5.40
3	6:1	5:2	3.00	2.00	5.40
4	8:1	7:2	3.00	2.00	5.40

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	211	823	196	0	0	0	0
	2	147	0	147	563	0	0	0	0
	3	412	0	0	0	0	0	0	0
	4	359	354	134	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	54	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	54	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	5/4, 5/2	Cx/1, Cx/2	#0000FF
	2	(untitled)	3/6, 3/2, 3/3	Dx/2, Dx/1	#FF0000
	3	(untitled)	1/4, 1/2, 1/3	Ax/1, Ax/2	#00FF00
	4	(untitled)	B-1/4, B-1/3, B-1/2	Bx/3, Bx/2, Bx/1	#FFFF00
	5	(untitled)	2:2E, 3:2E	2:2X, 3:2X	#FF00FF
	6	(untitled)	1:2E, 8:2E	1:2X, 8:2X	#008000
	7	(untitled)	4:2E, 5:1E	4:2X, 5:1X	#FFA500
	8	(untitled)	6:2E, 7:1E	6:2X, 7:1X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**4**		1	4	5/2, 4/3, C/4, Bx/3	Normal	98
	6		1	4	5/2, 4/3, C/4, Bx/2	Normal	98
	8		1	2	5/4, 4/5, C/1, Dx/1	Normal	211
	10		2	4	3/3, 2/3, D/3, Bx/3	Normal	282
	11		2	4	3/2, 2/2, D/2, Bx/2	Normal	282
	14		3	2	1/3, A/3, Dx/1	Normal	0
	26		2	3	3/2, 2/2, D/1, Ax/1	Normal	74
	27		2	3	3/2, 2/2, D/1, Ax/2	Normal	74
	28		1	3	5/4, 4/5, C/2, Ax/1	Normal	412
	29		1	3	5/2, 4/2, C/3, Ax/2	Normal	412
	30		4	3	B-1/4, B/4, Ax/2	Normal	67
	31		4	3	B-1/4, B/4, Ax/1	Normal	67
	33		3	1	1/3, A/3, Cx/2	Normal	206
	34		3	1	1/2, A/2, Cx/1	Normal	206
	35		4	1	B-1/3, B/1, Cx/1	Normal	180
	36		4	1	B-1/3, B/1, Cx/2	Normal	180
	37		2	1	3/3, 2/4, D/4, Cx/2	Normal	74
	38		2	1	3/3, 2/4, D/4, Cx/1	Normal	74
	40		3	4	1/2, A/1, Bx/2	Normal	0
	41		3	4	1/2, A/1, Bx/3	Normal	0
	42		4	2	B-1/3, B/2, Dx/1	Normal	354

Bus Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Bus Calculated Flow (PCU/hr)
1	**12**		2	4	3/6, 2/5, D/1, Bx/1	Normal	54
	39		4	2	B-1/2, B/3, Dx/2	Normal	54

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**18**		5	6	2:2E, 2:1X, 1:1E, 1:2X	Normal	300
	19		6	5	1:2E, 1:1X, 2:1E, 2:2X	Normal	300
	20		5	7	3:2E, 3:1X, 4:1E, 4:2X	Normal	300
	21		7	5	4:2E, 4:1X, 3:1E, 3:2X	Normal	300
	22		8	7	6:2E, 6:1X, 5:2E, 5:1X	Normal	300
	23		7	8	5:1E, 5:2X, 6:1E, 6:2X	Normal	300
	24		8	6	7:1E, 7:2X, 8:1E, 8:2X	Normal	300
	25		6	8	8:2E, 8:1X, 7:2E, 7:1X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		5	NetworkDefault	120	59

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	**A**	(untitled)	7	300	0	0	Unknown	
	B	(untitled)	7	300	0	0	Unknown	
	C	(untitled)	7	300	0	0	Unknown	
	D	(untitled)	7	300	0	0	Unknown	
	E	(untitled)	7	300	0	0	Unknown	
	F	(untitled)	7	300	0	0	Unknown	
	G	(untitled)	7	300	0	0	Unknown	
	H	(untitled)	7	300	0	0	Unknown	
	I	(untitled)	7	300	0	0	Unknown	
	J	(untitled)	7	300	0	0	Unknown	
	K	(untitled)	7	300	0	0	Unknown	
	L	(untitled)	7	300	0	0	Unknown	
	M	(untitled)	7	300	0	0	Unknown	
	N	(untitled)	7	300	0	0	Unknown	
	O	(untitled)	7	300	0	0	Unknown	
	P	(untitled)	7	300	0	0	Pedestrian	0
	Q	(untitled)	7	300	0	0	Pedestrian	0
	R	(untitled)	7	300	0	0	Pedestrian	0
	S	(untitled)	7	300	0	0	Pedestrian	0
	T	(untitled)	7	300	0	0	Pedestrian	0
	U	(untitled)	7	300	0	0	Pedestrian	0
	V	(untitled)	7	300	0	0	Pedestrian	0
	W	(untitled)	7	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	O, N, M, L, W, T, R	1	1	100
	2	I, J, K, B, C, D, V, R	1	1	100
	3	A, H, Q, U, R, V	1	1	100
	4	E, F, G, P, V, T, S	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 2, 3, 4	16, 44, 66, 89	66	
	2	(untitled)	Single	1, 2, 4, 3	15, 42, 68, 92	68	
	3	(untitled)	Single	1, 3, 2, 4	15, 40, 64, 89	70	
	4	(untitled)	Single	1, 3, 4, 2	15, 40, 63, 89	68	
	5	(untitled)	Single	1, 4, 2, 3	31, 53, 93, 112	59	
	6	(untitled)	Single	1, 4, 3, 2	16, 38, 63, 89	63	

Intergreen Matrix for Controller Stream 1

		To																						
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**
From	**A**					5	5			5	6	10	8	5	5						6			0
	B					6	7		7				5	5	5			0			6			
	C					6	7		5				5	5	5			0			6			
	D					7	8	11	5					5	5			0		11	6			
	E	8	5	5	5				5	7	8	11	7	5	6	11			6			0		0
	F	6	5	5	5				6	8	8	11	5						6					0
	G				5													9	6					
	H		5	5	10	8	5						5	5	5		6			0				
	I	7				5	5						5	6	7		6					0		
	J	5				5	5						6	7	8	11	6					0		
	K	5				5	5										6							10
	L	5	5	5		5	5		9	5	5							0					5	
	M	5	7	7	11	5			6	5	5									0			5	
	N	6	7	8	12	5			6	5	5									0			6	
	O					5					5											10	6	
	P								4	4	4	4												
	Q		5	5	5			5					5											
	R					5	5	5																
	S				4				4					4	4									
	T	1	1	1	1																			
	U					1				1	1					1								
	V												1	1	1	1								
	W	1				1	1					1												

Banned Stage transitions for Controller Stream 1

		To			
		1	**2**	**3**	**4**
From	**1**				
	2				
	3				
	4				

Interstage Matrix for Controller Stream 1

		To			
		1	**2**	**3**	**4**
From	**1**	0	12	10	6
	2	11	0	7	11
	3	8	10	0	8
	4	11	11	9	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	O,N,M,L,W,T,R	0	31	31	1	7
	2	✓	4	E,F,G,P,V,T,S	37	53	16	1	6
	3	✓	2	I,J,K,B,C,D,V,R	64	93	29	1	7
	4	✓	3	A,H,Q,U,R,V	100	112	12	1	7

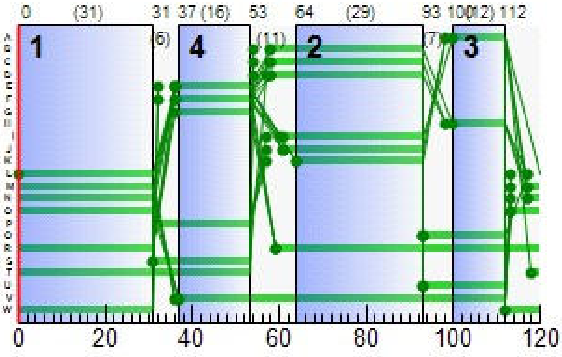
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	100	112	12
	B	1	✓	58	93	35
	C	1	✓	58	93	35
	D	1	✓	58	93	35
	E	1	✓	36	53	17
	F	1	✓	36	53	17
	G	1	✓	36	53	17
	H	1	✓	100	112	12
	I	1	✓	61	93	32
	J	1	✓	61	93	32
	K	1	✓	64	93	29
	L	1	✓	0	31	31
	M	1	✓	117	31	34
	N	1	✓	117	31	34
	O	1	✓	113	31	38
	P	1	✓	31	53	22
	Q	1	✓	93	112	19
	R	1	✓	59	31	92
	S	1	✓	31	53	22
	T	1	✓	118	53	55
	U	1	✓	93	112	19
	V	1	✓	37	112	75
	W	1	✓	112	31	39

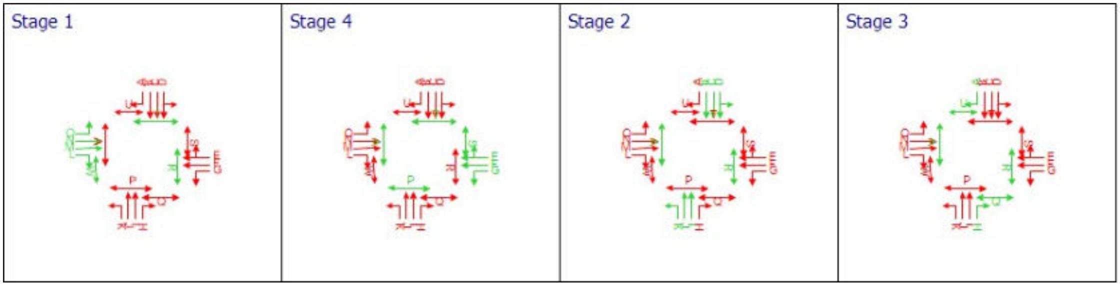
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	G	36	53	17
A	2	1	1	F	36	53	17
A	3	1	1	E	36	53	17
B	1	1	1	K	64	93	29
B	2	1	1	J	61	93	32
B	3	1	1	I	61	93	32
B	4	1	1	H	100	112	12
C	1	1	1	O	113	31	38
C	2	1	1	N	117	31	34
C	3	1	1	M	117	31	34
C	4	1	1	L	0	31	31
D	1	1	1	D	58	93	35
D	2	1	1	C	58	93	35
D	3	1	1	B	58	93	35
D	4	1	1	A	100	112	12

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1 NB**	(untitled)	1	1	G	0	1800	17	18.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	F	206 <	1800	17	0.00	76	18	72.78	69.20	110.71	7.74 +
	3	(untitled)	1	1	E	206 <	1800	17	0.00	76	18	72.78	69.20	110.71	7.74 +
Ax	**1**	(untitled)				553	Unrestricted	120	25.00	0	Unrestricted	11.27	0.00	0.00	0.00
	2	(untitled)				553	Unrestricted	120	25.00	0	Unrestricted	11.27	0.00	0.00	0.00
B	**1**	(untitled)	1	1	K	360 <	1800	29	0.00	80	13	61.94	57.41	104.36	12.72 +
	2	(untitled)	1	1	J	354 <	1800	32	0.00	72	26	52.42	48.19	95.92	11.50 +
	3 B	(untitled)	1	1	I	54	1800	32	30.00	11	725	41.86	32.99	74.10	1.34
	4	(untitled)	1	1	H	134	1800	12	0.00	69	31	75.12	70.94	110.36	5.00
Bx	**1 B**	(untitled)				54	Unrestricted	120	91.00	0	Unrestricted	27.61	0.00	0.00	0.00
	2	(untitled)				380	Unrestricted	120	44.00	0	Unrestricted	12.91	0.00	0.00	0.00
	3	(untitled)				380	Unrestricted	120	44.00	0	Unrestricted	12.90	0.00	0.00	0.00
C	**1**	(untitled)	1	1	O	211	1800	38	0.00	36	150	37.90	32.71	76.24	5.44
	2	(untitled)	1	1	N	412 <	1800	34	0.00	78	15	56.06	51.08	99.88	13.97 +
	3	(untitled)	1	1	M	412 <	1800	34	0.00	78	15	56.07	51.08	99.88	13.97 +
	4	(untitled)	1	1	L	196	1800	31	0.00	41	120	43.78	38.79	82.79	5.48
Cx	**1**	(untitled)				460	Unrestricted	120	34.00	0	Unrestricted	16.12	0.00	0.00	0.00
	2	(untitled)				460	Unrestricted	120	34.00	0	Unrestricted	16.12	0.00	0.00	0.00
D	**1 NB**	(untitled)	1	1	D	202 <	1800	35	0.00	37	141	39.74	35.11	79.09	5.39 +
	2	(untitled)	1	1	C	282 <	1800	35	0.00	52	72	42.03	38.49	84.37	8.04 +
	3	(untitled)	1	1	B	282 <	1800	35	0.00	52	72	42.03	38.49	84.37	8.04 +
	4	(untitled)	1	1	A	148 <	1800	12	0.00	76	19	82.46	78.92	116.89	5.88 +
Dx	**1**	(untitled)				565	Unrestricted	120	34.00	0	Unrestricted	14.57	0.00	0.00	0.00
	2 B	(untitled)				54	Unrestricted	120	93.00	0	Unrestricted	31.00	0.00	0.00	0.00
1	**2**		1			206	1800	120	45.00	11	686	3.06	0.13	0.00	0.01
	3		1			206	1800	120	45.00	11	686	3.06	0.13	0.00	0.01
	4 B		1			0	1800	120	120.00	0	Unrestricted	0.00	0.00	0.00	0.00
B-1	**2 B**		1			54	1800	120	120.00	3	2900	8.45	0.03	0.00	0.00
	3		1			714	1800	120	62.00	40	127	4.87	0.66	0.00	0.13
	4		1			134	1800	120	0.00	7	1109	4.29	0.08	0.00	0.00
2	**2**		1			430	1800	120	38.00	24	277	3.79	0.31	0.00	0.04
	3		1			282	1800	120	38.00	16	474	3.67	0.19	0.00	0.01
	4		1			148	1800	120	19.00	8	995	3.69	0.09	0.00	0.00
	5 B		1			54	1800	120	120.00	3	2900	6.99	0.03	0.00	0.00
3	**2**		1			430	1800	120	0.00	24	277	3.24	0.31	0.00	0.04
	3		1			430	1800	120	0.00	24	277	3.24	0.31	0.00	0.04
	6 B		1			54	1800	120	120.00	3	2900	5.89	0.03	0.00	0.00
4	**2**		1			412	1800	120	59.00	23	293	3.83	0.30	0.00	0.03
	3		1			196	1800	120	0.00	11	727	3.89	0.12	0.00	0.01
	5		1			623	1800	120	59.00	35	160	4.07	0.53	0.00	0.09
5	**2**		1			608	1800	120	0.00	34	166	3.44	0.51	0.00	0.09
	4		1			623	1800	120	0.00	35	160	3.46	0.53	0.00	0.09

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	650.38	69.75	9.32	37.29	10.78	682.56	40.51	0.00	723.07
Bus	21.60	2.46	8.77	0.98	0.04	14.52	0.26	0.00	14.78
Tram									
Pedestrians	34.80	55.53	0.63	48.87	0.00	693.89	0.00	0.00	693.89
TOTAL	706.79	127.74	5.53	87.14	10.82	1390.97	40.77	0.00	1431.74

- *N = at least one source for this link/traffic stream carries normal traffic*
- *B = at least one source for this link/traffic stream carries Bus traffic*
- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 2 - 2040 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 2\Upgraded Layout
Report generation date: 28/04/2022 03:32:33

Summary of network performance

	AM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 2 [A2] - 2040 "with development"			
Network	1228.39	84.32	71% (TS B/2)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

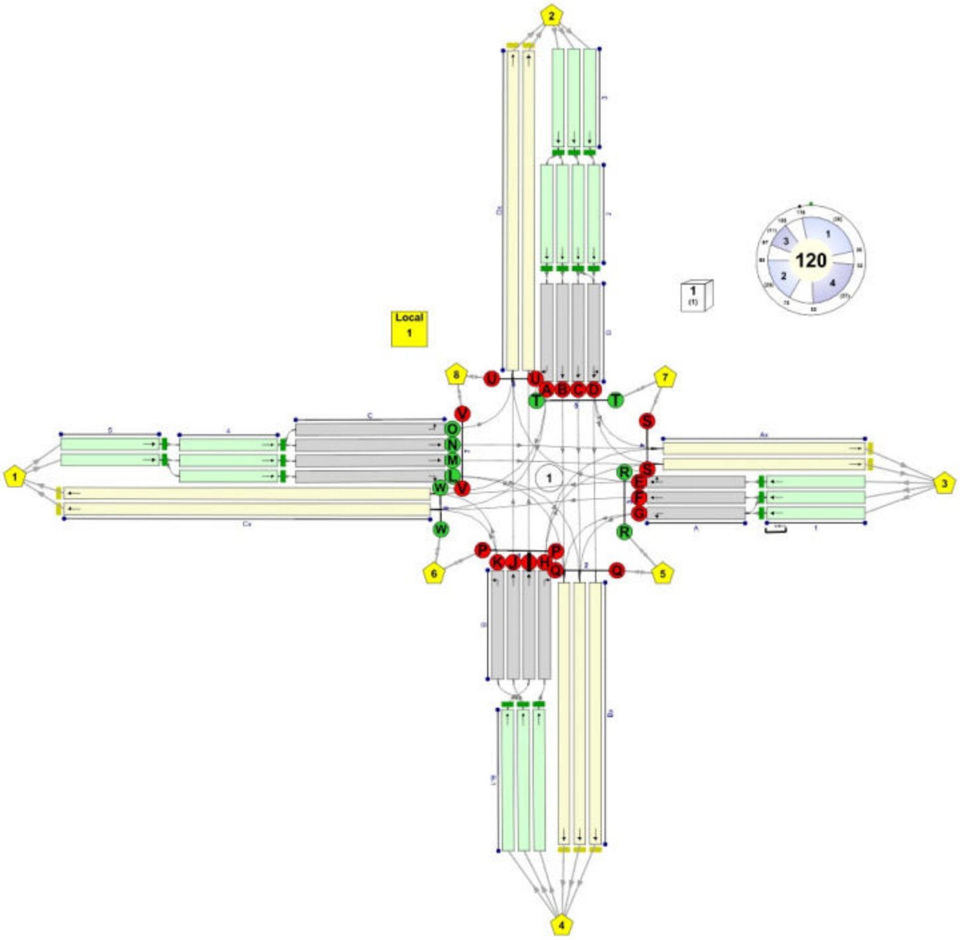
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 2 [A2]
D1 - 2040 "with development", AM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Traffic Stream Flows	Arm 1 - Traffic Stream 4 (Bus) - Flows (08:00-09:00)	Traffic Stream 1/4 has no paths passing through it, so will not be assigned any flows.

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 03:32:17	28/04/2022 03:32:25	8.65	08:00	120	1228.39	84.32	70.56	B/2	0	0	B/2	5/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Junction 2 [A2]			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development"	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
1	(untitled)		1
B-1	(untitled)		1
2	(untitled)		1
3	(untitled)		1
4	(untitled)		1
5	(untitled)		1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	30.67	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	93.88						Normal	
	2	(untitled)		✓	93.94						Normal	
B	1	(untitled)		✓	37.78	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	35.22	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	36.96	✓	Sum of lanes	1800	✓		Bus	
	4	(untitled)		✓	34.84	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	115.03						Bus	
	2	(untitled)		✓	107.54						Normal	
	3	(untitled)		✓	107.49						Normal	
C	1	(untitled)		✓	43.30	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	41.51	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	41.53	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	41.55	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	134.35						Normal	
	2	(untitled)		✓	134.34						Normal	
D	1	(untitled)		✓	30.45	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	121.45						Normal	
	2	(untitled)		✓	129.15						Bus	
1	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Bus	
B-1	2			✓	35.10	✓	Sum of lanes	1800			Bus	
	3			✓	35.10	✓	Sum of lanes	1800			Normal	
	4			✓	35.10	✓	Sum of lanes	1800			Normal	
2	2			✓	29.00	✓	Sum of lanes	1800			Normal	
	3			✓	29.00	✓	Sum of lanes	1800			Normal	
	4			✓	30.01	✓	Sum of lanes	1800			Normal	
	5			✓	29.00	✓	Sum of lanes	1800			Bus	
3	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	6			✓	24.40	✓	Sum of lanes	1800			Bus	
4	2			✓	29.47	✓	Sum of lanes	1800			Normal	
	3			✓	31.40	✓	Sum of lanes	1800			Normal	
	5			✓	29.47	✓	Sum of lanes	1800			Normal	
5	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	2	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
Ax	1	2	(untitled)			
	2	1	(untitled)			
B	1	2	(untitled)			1800
	2	4	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
Bx	1	3	(untitled)			
	2	1	(untitled)			
	3	2	(untitled)			
C	1	4	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
	4	2	(untitled)			1800
Cx	1	1	(untitled)			
	2	2	(untitled)			
D	1	5	(untitled)			1800
	2	2	(untitled)			1800
	3	4	(untitled)			1800
	4	3	(untitled)			1800
Dx	1	1	(untitled)			
	2	2	(untitled)			
1	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
B-1	2	2	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
2	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
	5	1	(untitled)			1800
3	2	1	(untitled)			1800
	3	1	(untitled)			1800
	6	1	(untitled)			1800
4	2	1	(untitled)			1800
	3	1	(untitled)			1800
	5	1	(untitled)			1800
5	2	1	(untitled)			1800
	4	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Bus - Modelling

Arm	Traffic Stream	Stationary time (seconds)	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	0.00	100	100

Bus - Advanced

Arm	Traffic Stream	Dispersion type	Use network default acceleration
(ALL)	**(ALL)**	NetworkDefault	✓

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)	Bus Flow (PCU/hr)
A	1	0	0	0
	2	301	301	
	3	301	301	
Ax	1	410	410	
	2	410	410	
B	1	6	6	
	2	254	254	
	3	54		54
	4	103	103	
Bx	1	54		54
	2	323	323	
	3	323	323	
C	1	143	143	
	2	358	358	
	3	358	358	
	4	150	150	
Cx	1	364	364	
	2	364	364	
D	1	54	0	54
	2	248	248	
	3	248	248	
	4	120	120	
Dx	1	397	397	
	2	54		54
1	2	301	301	
	3	301	301	
	4	0		0
B-1	2	54		54
	3	260	260	
	4	103	103	
2	2	248	248	
	3	248	248	
	4	120	120	
	5	54		54
3	2	248	248	
	3	368	368	
	6	54		54
4	2	358	358	
	3	150	150	
	5	501	501	
5	2	508	508	
	4	501	501	

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	G	
	2	1	F	
	3	1	E	
B	1	1	K	
	2	1	J	
	3	1	I	
	4	1	H	
C	1	1	O	
	2	1	N	
	3	1	M	
	4	1	L	
D	1	1	D	
	2	1	C	
	3	1	B	
	4	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)
1	2	2.93	30.00	
	3	2.93	30.00	
	4			15.00
B-1	2			15.00
	3	4.21	30.00	
	4	4.21	30.00	
3	2	2.93	30.00	
	3	2.93	30.00	
	6			15.00
5	2	2.93	30.00	
	4	2.93	30.00	

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	1/4	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
	2	1	1/2	A/2	3.58	30.00		✓	Straight	Straight Movement
	3	1	1/3	A/3	3.58	30.00		✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	11.27	30.00		✓	Nearside	16.65
	2	1	D/1	Ax/2	11.27	30.00		✓	Nearside	17.23
B	1	1	B-1/3	B/1	4.53	30.00		✓	Straight	Straight Movement
	2	1	B-1/3	B/2	4.23	30.00		✓	Straight	Straight Movement
	3	1	B-1/2	B/3			15.00	✓	Straight	Straight Movement
	4	1	B-1/4	B/4	4.18	30.00		✓	Straight	Straight Movement
Bx	1	1	D/1	Bx/1			15.00	✓	Straight	Straight Movement
	2	1	C/4	Bx/2	12.91	30.00		✓	Offside	26.45
	3	1	C/4	Bx/3	12.90	30.00		✓	Offside	26.45
	1	1	4/5	C/1	5.20	30.00		✓	Straight	Straight Movement

C	**2**	**1**	4/5	C/2	4.98	30.00		✓	Straight	Straight Movement
	3	**1**	4/2	C/3	4.98	30.00		✓	Straight	Straight Movement
	4	**1**	4/3	C/4	4.99	30.00		✓	Straight	Straight Movement
Cx	**1**	**1**	A/2	Cx/1	16.12	30.00		✓	Straight	Straight Movement
	2	**1**	A/3	Cx/2	16.12	30.00		✓	Straight	Straight Movement
D	**1**	**1**	2/5	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
	2	**1**	2/2	D/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	2/3	D/3	3.54	30.00		✓	Straight	Straight Movement
	4	**1**	2/4	D/4	3.54	30.00		✓	Straight	Straight Movement
Dx	**1**	**1**	B/2	Dx/1	14.57	30.00		✓	Straight	Straight Movement
	2	**1**	B/3	Dx/2			15.00	✓	Straight	Straight Movement
2	**2**	**1**	3/2	2/2	3.48	30.00		✓	Straight	Straight Movement
	3	**1**	3/3	2/3	3.48	30.00		✓	Straight	Straight Movement
	4	**1**	3/3	2/4	3.60	30.00		✓	Straight	Straight Movement
	5	**1**	3/6	2/5			15.00	✓	Straight	Straight Movement
4	**2**	**1**	5/2	4/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	5/2	4/3	3.77	30.00		✓	Straight	Straight Movement
	5	**1**	5/4	4/5	3.54	30.00		✓	Straight	Straight Movement
A	**1**	**2**	1/2	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
Ax	**1**	**2**	C/2	Ax/1	11.27	30.00		✓	Straight	Straight Movement
	2	**2**	C/3	Ax/2	11.27	30.00		✓	Straight	Straight Movement
Bx	**2**	**2**	D/2	Bx/2	12.91	30.00		✓	Straight	Straight Movement
	3	**2**	D/3	Bx/3	12.90	30.00		✓	Straight	Straight Movement
Cx	**1**	**2**	B/1	Cx/1	16.12	30.00		✓	Nearside	15.08
	2	**2**	B/1	Cx/2	16.12	30.00		✓	Nearside	16.75
D	**1**	**2**	2/2	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	14.57	30.00		✓	Nearside	14.66
Ax	**1**	**3**	B/4	Ax/1	11.27	30.00		✓	Offside	29.45
	2	**3**	B/4	Ax/2	11.27	30.00		✓	Offside	26.33
Bx	**2**	**3**	A/1	Bx/2	12.91	30.00		✓	Nearside	16.74
	3	**3**	A/1	Bx/3	12.90	30.00		✓	Nearside	17.18
Cx	**1**	**3**	D/4	Cx/1	16.12	30.00		✓	Offside	28.88
	2	**3**	D/4	Cx/2	16.12	30.00		✓	Offside	27.91
Dx	**1**	**3**	A/3	Dx/1	14.57	30.00		✓	Offside	27.77

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40
5	(untitled)				Farside	3.00	2.00	5.40
6	(untitled)				Farside	3.00	2.00	5.40
7	(untitled)				Farside	3.00	2.00	5.40
8	(untitled)				Farside	3.00	2.00	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	P	
2	1	Q	
3	1	R	
4	1	S	
5	1	T	
6	1	U	
7	1	V	
8	1	W	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Pedestrian Crossing Connectors

Pedestrian Crossing Connectors

Pedestrian crossing connector	Pedestrian crossing1	Pedestrian crossing2	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	2:1	1:1	3.00	2.00	5.40
2	4:1	3:1	3.00	2.00	5.40
3	6:1	5:2	3.00	2.00	5.40
4	8:1	7:2	3.00	2.00	5.40

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

	To								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	143	716	150	0	0	0	0
	2	120	0	0	495	0	0	0	0
	3	602	0	0	0	0	0	0	0
	4	6	254	103	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows (PCU/hr)

	To								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	54	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	54	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

	To								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	5/4, 5/2	Cx/1, Cx/2	#0000FF
	2	(untitled)	3/6, 3/2, 3/3	Dx/2, Dx/1	#FF0000
	3	(untitled)	1/4, 1/2, 1/3	Ax/1, Ax/2	#00FF00
	4	(untitled)	B-1/4, B-1/3, B-1/2	Bx/3, Bx/2, Bx/1	#FFFF00
	5	(untitled)	2:2E, 3:2E	2:2X, 3:2X	#FF00FF
	6	(untitled)	1:2E, 8:2E	1:2X, 8:2X	#008000
	7	(untitled)	4:2E, 5:1E	4:2X, 5:1X	#FFA500
	8	(untitled)	6:2E, 7:1E	6:2X, 7:1X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**4**		1	4	5/2, 4/3, C/4, Bx/3	Normal	75
	6		1	4	5/2, 4/3, C/4, Bx/2	Normal	75
	8		1	2	5/4, 4/5, C/1, Dx/1	Normal	143
	10		2	4	3/3, 2/3, D/3, Bx/3	Normal	248
	11		2	4	3/2, 2/2, D/2, Bx/2	Normal	248
	14		3	2	1/3, A/3, Dx/1	Normal	0
	26		2	3	3/2, 2/2, D/1, Ax/1	Normal	0
	27		2	3	3/2, 2/2, D/1, Ax/2	Normal	0
	28		1	3	5/4, 4/5, C/2, Ax/1	Normal	358
	29		1	3	5/2, 4/2, C/3, Ax/2	Normal	358
	30		4	3	B-1/4, B/4, Ax/2	Normal	52
	31		4	3	B-1/4, B/4, Ax/1	Normal	52
	33		3	1	1/3, A/3, Cx/2	Normal	301
	34		3	1	1/2, A/2, Cx/1	Normal	301
	35		4	1	B-1/3, B/1, Cx/1	Normal	3
	36		4	1	B-1/3, B/1, Cx/2	Normal	3
	37		2	1	3/3, 2/4, D/4, Cx/2	Normal	60
	38		2	1	3/3, 2/4, D/4, Cx/1	Normal	60
	40		3	4	1/2, A/1, Bx/2	Normal	0
	41		3	4	1/2, A/1, Bx/3	Normal	0
	42		4	2	B-1/3, B/2, Dx/1	Normal	254

Bus Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Bus Calculated Flow (PCU/hr)
1	**12**		2	4	3/6, 2/5, D/1, Bx/1	Normal	54
	39		4	2	B-1/2, B/3, Dx/2	Normal	54

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**18**		5	6	2:2E, 2:1X, 1:1E, 1:2X	Normal	300
	19		6	5	1:2E, 1:1X, 2:1E, 2:2X	Normal	300
	20		5	7	3:2E, 3:1X, 4:1E, 4:2X	Normal	300
	21		7	5	4:2E, 4:1X, 3:1E, 3:2X	Normal	300
	22		8	7	6:2E, 6:1X, 5:2E, 5:1X	Normal	300
	23		7	8	5:1E, 5:2X, 6:1E, 6:2X	Normal	300
	24		8	6	7:1E, 7:2X, 8:1E, 8:2X	Normal	300
	25		6	8	8:2E, 8:1X, 7:2E, 7:1X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		5	NetworkDefault	120	59

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	**A**	(untitled)	7	300	0	0	Unknown	
	B	(untitled)	7	300	0	0	Unknown	
	C	(untitled)	7	300	0	0	Unknown	
	D	(untitled)	7	300	0	0	Unknown	
	E	(untitled)	7	300	0	0	Unknown	
	F	(untitled)	7	300	0	0	Unknown	
	G	(untitled)	7	300	0	0	Unknown	
	H	(untitled)	7	300	0	0	Unknown	
	I	(untitled)	7	300	0	0	Unknown	
	J	(untitled)	7	300	0	0	Unknown	
	K	(untitled)	7	300	0	0	Unknown	
	L	(untitled)	7	300	0	0	Unknown	
	M	(untitled)	7	300	0	0	Unknown	
	N	(untitled)	7	300	0	0	Unknown	
	O	(untitled)	7	300	0	0	Unknown	
	P	(untitled)	7	300	0	0	Pedestrian	0
	Q	(untitled)	7	300	0	0	Pedestrian	0
	R	(untitled)	7	300	0	0	Pedestrian	0
	S	(untitled)	7	300	0	0	Pedestrian	0
	T	(untitled)	7	300	0	0	Pedestrian	0
	U	(untitled)	7	300	0	0	Pedestrian	0
	V	(untitled)	7	300	0	0	Pedestrian	0
	W	(untitled)	7	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	O, N, M, L, W, T, R	1	1	100
	2	I, J, K, B, C, D, V, R	1	1	100
	3	A, H, Q, U, R, V	1	1	100
	4	E, F, G, P, V, T, S	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 2, 3, 4	16, 44, 66, 89	66	
	2	(untitled)	Single	1, 2, 4, 3	15, 42, 68, 92	68	
	3	(untitled)	Single	1, 3, 2, 4	15, 40, 64, 89	70	
	4	(untitled)	Single	1, 3, 4, 2	15, 40, 63, 89	68	
	5	(untitled)	Single	1, 4, 2, 3	26, 59, 90, 108	59	
	6	(untitled)	Single	1, 4, 3, 2	16, 38, 63, 89	63	

Intergreen Matrix for Controller Stream 1

		To																						
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
From	A					5	5			5	6	10	8	5	5						6			0
	B					6	7		7				5	5	5			0			6			
	C					6	7		5				5	5	5			0			6			
	D					7	8	11	5					5	5			0		11	6			
	E	8	5	5	5				5	7	8	11	7	5	6	11			6			0		0
	F	6	5	5	5				6	8	8	11	5						6					0
	G				5													9	6					
	H		5	5	10	8	5						5	5	5		6			0				
	I	7				5	5						5	6	7		6					0		
	J	5				5	5						6	7	8	11	6					0		
	K	5				5	5										6							10
	L	5	5	5		5	5		9	5	5							0					5	
	M	5	7	7	11	5			6	5	5									0			5	
	N	6	7	8	12	5			6	5	5									0			6	
	O					5					5											10	6	
	P								4	4	4	4												
	Q		5	5	5			5					5											
	R					5	5	5																
	S				4				4					4	4									
	T	1	1	1	1																			
	U					1				1	1					1								
	V												1	1	1	1								
	W	1				1	1					1												

Banned Stage transitions for Controller Stream 1

		To			
		1	2	3	4
From	1				
	2				
	3				
	4				

Interstage Matrix for Controller Stream 1

		To			
		1	2	3	4
From	1	0	12	10	6
	2	11	0	7	11
	3	8	10	0	8
	4	11	11	9	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	O,N,M,L,W,T,R	116	26	30	1	7
	2	✓	4	E,F,G,P,V,T,S	32	59	27	1	6
	3	✓	2	I,J,K,B,C,D,V,R	70	90	20	1	7
	4	✓	3	A,H,Q,U,R,V	97	108	11	1	7

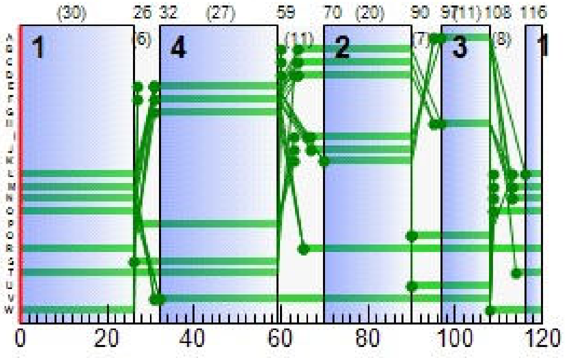
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	97	108	11
	B	**1**	✓	64	90	26
	C	**1**	✓	64	90	26
	D	**1**	✓	64	90	26
	E	**1**	✓	31	59	28
	F	**1**	✓	31	59	28
	G	**1**	✓	31	59	28
	H	**1**	✓	97	108	11
	I	**1**	✓	67	90	23
	J	**1**	✓	67	90	23
	K	**1**	✓	70	90	20
	L	**1**	✓	116	26	30
	M	**1**	✓	113	26	33
	N	**1**	✓	113	26	33
	O	**1**	✓	109	26	37
	P	**1**	✓	26	59	33
	Q	**1**	✓	90	108	18
	R	**1**	✓	65	26	81
	S	**1**	✓	26	59	33
	T	**1**	✓	114	59	65
	U	**1**	✓	90	108	18
	V	**1**	✓	32	108	76
	W	**1**	✓	108	26	38

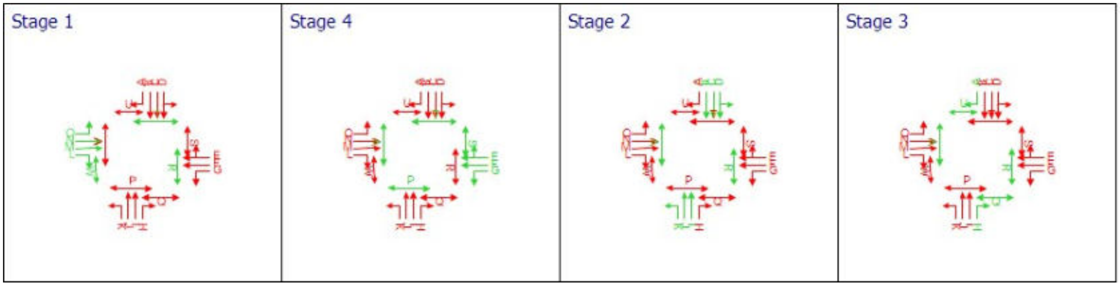
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	**1**	1	1	G	31	59	28
A	**2**	1	1	F	31	59	28
A	**3**	1	1	E	31	59	28
B	**1**	1	1	K	70	90	20
B	**2**	1	1	J	67	90	23
B	**3**	1	1	I	67	90	23
B	**4**	1	1	H	97	108	11
C	**1**	1	1	O	109	26	37
C	**2**	1	1	N	113	26	33
C	**3**	1	1	M	113	26	33
C	**4**	1	1	L	116	26	30
D	**1**	1	1	D	64	90	26
D	**2**	1	1	C	64	90	26
D	**3**	1	1	B	64	90	26
D	**4**	1	1	A	97	108	11

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1 NB**	(untitled)	1	1	G	0	1800	28	29.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	F	301 <	1800	28	0.00	69	30	54.11	50.53	96.93	9.87 +
	3	(untitled)	1	1	E	301 <	1800	28	0.00	69	30	54.11	50.53	96.93	9.87 +
Ax	**1**	(untitled)				410	Unrestricted	120	64.00	0	Unrestricted	11.27	0.00	0.00	0.00
	2	(untitled)				410	Unrestricted	120	64.00	0	Unrestricted	11.27	0.00	0.00	0.00
B	**1**	(untitled)	1	1	K	6	1800	20	20.00	2	4625	45.89	41.36	81.61	0.17
	2	(untitled)	1	1	J	254 <	1800	23	0.00	71	28	60.59	56.36	100.92	8.65 +
	3 B	(untitled)	1	1	I	54	1800	23	21.00	15	500	49.34	40.47	81.96	1.48
	4	(untitled)	1	1	H	104	1800	11	0.00	58	56	69.12	64.94	104.83	3.68
Bx	**1 B**	(untitled)				54	Unrestricted	120	95.00	0	Unrestricted	27.61	0.00	0.00	0.00
	2	(untitled)				323	Unrestricted	120	55.00	0	Unrestricted	12.91	0.00	0.00	0.00
	3	(untitled)				323	Unrestricted	120	55.00	0	Unrestricted	12.90	0.00	0.00	0.00
C	**1**	(untitled)	1	1	O	143	1800	37	0.00	25	259	36.69	31.49	73.63	3.58
	2	(untitled)	1	1	N	358 <	1800	33	0.00	70	28	51.60	46.62	94.49	11.45 +
	3	(untitled)	1	1	M	358 <	1800	33	0.00	70	28	51.61	46.62	94.49	11.45 +
	4	(untitled)	1	1	L	150	1800	30	0.00	32	179	42.83	37.85	81.00	4.12
Cx	**1**	(untitled)				364	Unrestricted	120	58.00	0	Unrestricted	16.12	0.00	0.00	0.00
	2	(untitled)				364	Unrestricted	120	58.00	0	Unrestricted	16.12	0.00	0.00	0.00
D	**1 NB**	(untitled)	1	1	D	54	1800	26	24.00	13	575	45.16	37.85	79.30	1.44
	2	(untitled)	1	1	C	248 <	1800	26	0.00	61	47	52.26	48.72	93.82	7.85 +
	3	(untitled)	1	1	B	248 <	1800	26	0.00	61	47	52.26	48.72	93.82	7.85 +
	4	(untitled)	1	1	A	120	1800	11	0.00	67	35	74.79	71.25	110.20	4.47
Dx	**1**	(untitled)				397	Unrestricted	120	45.00	0	Unrestricted	14.57	0.00	0.00	0.00
	2 B	(untitled)				54	Unrestricted	120	96.00	0	Unrestricted	31.00	0.00	0.00	0.00
1	**2**		1			301	1800	120	57.00	17	438	3.13	0.20	0.00	0.02
	3		1			301	1800	120	57.00	17	438	3.13	0.20	0.00	0.02
	4 B		1			0	1800	120	120.00	0	Unrestricted	0.00	0.00	0.00	0.00
B-1	**2 B**		1			54	1800	120	120.00	3	2900	8.45	0.03	0.00	0.00
	3		1			260	1800	120	36.00	14	523	4.38	0.17	0.00	0.01
	4		1			104	1800	120	0.00	6	1458	4.27	0.06	0.00	0.00
2	**2**		1			248	1800	120	40.00	14	553	3.64	0.16	0.00	0.01
	3		1			248	1800	120	40.00	14	553	3.64	0.16	0.00	0.01
	4		1			120	1800	120	0.00	7	1250	3.67	0.07	0.00	0.00
	5 B		1			54	1800	120	120.00	3	2900	6.99	0.03	0.00	0.00
3	**2**		1			248	1800	120	0.00	14	553	3.09	0.16	0.00	0.01
	3		1			368	1800	120	0.00	20	340	3.18	0.26	0.00	0.03
	6 B		1			54	1800	120	120.00	3	2900	5.89	0.03	0.00	0.00
4	**2**		1			358	1800	120	43.00	20	353	3.78	0.25	0.00	0.02
	3		1			150	1800	120	0.00	8	980	3.86	0.09	0.00	0.00
	5		1			501	1800	120	43.00	28	223	3.92	0.39	0.00	0.05
5	**2**		1			508	1800	120	0.00	28	219	3.32	0.39	0.00	0.06
	4		1			501	1800	120	0.00	28	223	3.31	0.39	0.00	0.05

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	498.66	52.48	9.50	29.50	6.36	509.23	30.78	0.00	540.01
Bus	21.60	2.62	8.26	1.15	0.02	16.70	0.27	0.00	16.98
Tram									
Pedestrians	34.80	53.95	0.65	47.28	0.00	671.40	0.00	0.00	671.40
TOTAL	555.06	109.05	5.09	77.93	6.39	1197.33	31.05	0.00	1228.39

- *N = at least one source for this link/traffic stream carries normal traffic*
- *B = at least one source for this link/traffic stream carries Bus traffic*
- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777   software@trl.co.uk   www.trlsoftware.co.uk

Filename: Junction 2 - 2040 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 2\Upgraded Layout
Report generation date: 28/04/2022 03:37:09

Summary of network performance

	PM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 2 [A2] - 2040 "with development"			
Network	1249.82	85.76	75% (TS B/2)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

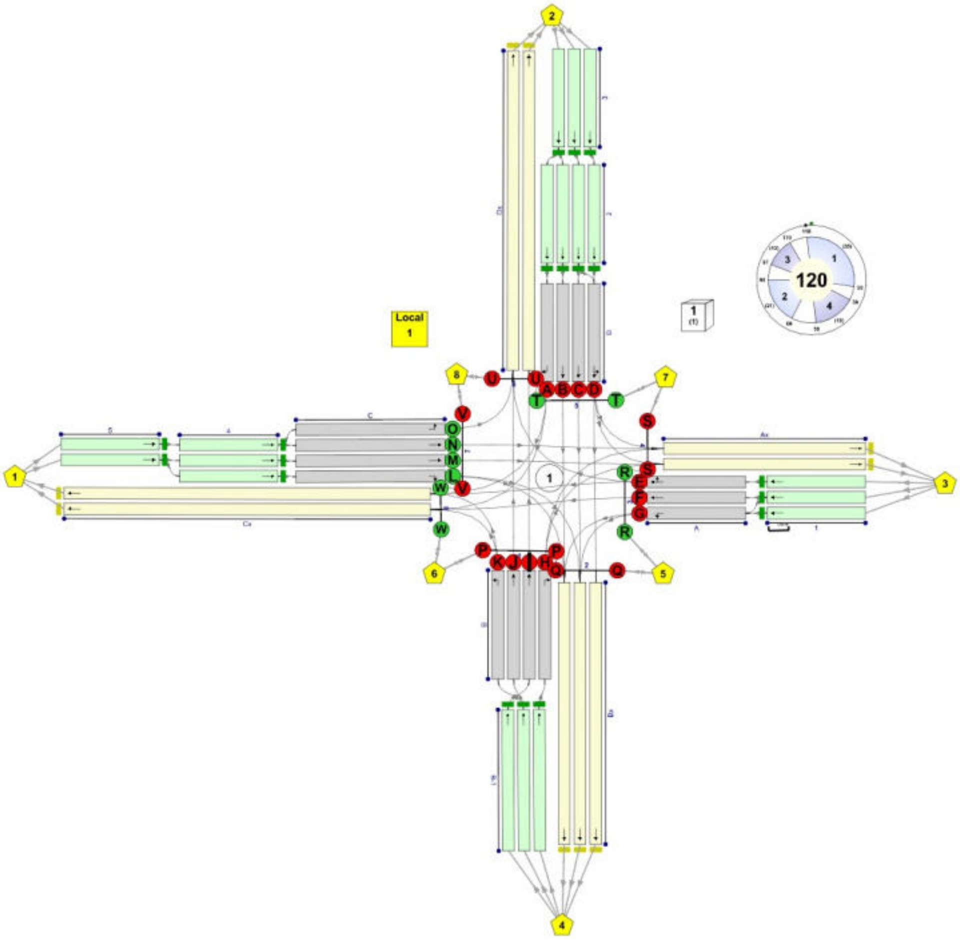
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 2 [A2]
D1 - 2040 "with development", PM

Summary

Data Errors and Warnings

Severity	Area	Item	Description
Info	Traffic Stream Flows	Arm 1 - Traffic Stream 4 (Bus) - Flows (17:00-18:00)	Traffic Stream 1/4 has no paths passing through it, so will not be assigned any flows.

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 03:36:52	28/04/2022 03:37:00	8.25	17:00	120	1249.82	85.76	74.67	B/2	0	0	B/2	4/5

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set (s)	Specific Demand Set (s)	Optimise specific Demand Set (s)	Include in report	Locked
Junction 2 [A2]			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
1	(untitled)		1
B-1	(untitled)		1
2	(untitled)		1
3	(untitled)		1
4	(untitled)		1
5	(untitled)		1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	30.67	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.80	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	93.88						Normal	
	2	(untitled)		✓	93.94						Normal	
B	1	(untitled)		✓	37.78	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	35.22	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	36.96	✓	Sum of lanes	1800	✓		Bus	
	4	(untitled)		✓	34.84	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	115.03						Bus	
	2	(untitled)		✓	107.54						Normal	
	3	(untitled)		✓	107.49						Normal	
C	1	(untitled)		✓	43.30	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	41.51	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	41.53	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	41.55	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	134.35						Normal	
	2	(untitled)		✓	134.34						Normal	
D	1	(untitled)		✓	30.45	✓	Sum of lanes	1800	✓		Normal, Bus	
	2	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
	4	(untitled)		✓	29.50	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	121.45						Normal	
	2	(untitled)		✓	129.15						Bus	
1	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Bus	
B-1	2			✓	35.10	✓	Sum of lanes	1800			Bus	
	3			✓	35.10	✓	Sum of lanes	1800			Normal	
	4			✓	35.10	✓	Sum of lanes	1800			Normal	
2	2			✓	29.00	✓	Sum of lanes	1800			Normal	
	3			✓	29.00	✓	Sum of lanes	1800			Normal	
	4			✓	30.01	✓	Sum of lanes	1800			Normal	
	5			✓	29.00	✓	Sum of lanes	1800			Bus	
3	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	3			✓	24.40	✓	Sum of lanes	1800			Normal	
	6			✓	24.40	✓	Sum of lanes	1800			Bus	
4	2			✓	29.47	✓	Sum of lanes	1800			Normal	
	3			✓	31.40	✓	Sum of lanes	1800			Normal	
	5			✓	29.47	✓	Sum of lanes	1800			Normal	
5	2			✓	24.40	✓	Sum of lanes	1800			Normal	
	4			✓	24.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	2	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
Ax	1	2	(untitled)			
	2	1	(untitled)			
B	1	2	(untitled)			1800
	2	4	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
Bx	1	3	(untitled)			
	2	1	(untitled)			
	3	2	(untitled)			
C	1	4	(untitled)			1800
	2	1	(untitled)			1800
	3	3	(untitled)			1800
	4	2	(untitled)			1800
Cx	1	1	(untitled)			
	2	2	(untitled)			
D	1	5	(untitled)			1800
	2	2	(untitled)			1800
	3	4	(untitled)			1800
	4	3	(untitled)			1800
Dx	1	1	(untitled)			
	2	2	(untitled)			
1	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
B-1	2	2	(untitled)			1800
	3	3	(untitled)			1800
	4	1	(untitled)			1800
2	2	1	(untitled)			1800
	3	1	(untitled)			1800
	4	1	(untitled)			1800
	5	1	(untitled)			1800
3	2	1	(untitled)			1800
	3	1	(untitled)			1800
	6	1	(untitled)			1800
4	2	1	(untitled)			1800
	3	1	(untitled)			1800
	5	1	(untitled)			1800
5	2	1	(untitled)			1800
	4	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Bus - Modelling

Arm	Traffic Stream	Stationary time (seconds)	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	0.00	100	100

Bus - Advanced

Arm	Traffic Stream	Dispersion type	Use network default acceleration
(ALL)	(ALL)	NetworkDefault	✓

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)	Bus Flow (PCU/hr)
A	1	0	0	0
	2	206	206	
	3	206	206	
Ax	1	548	548	
	2	548	548	
B	1	60	60	
	2	280	280	
	3	54		54
	4	139	139	
Bx	1	54		54
	2	287	287	
	3	287	287	
C	1	168	168	
	2	408	408	
	3	408	408	
	4	153	153	
Cx	1	308	308	
	2	308	308	
D	1	194	140	54
	2	210	210	
	3	210	210	
	4	144	144	
Dx	1	448	448	
	2	54		54
1	2	206	206	
	3	206	206	
	4	0		0
B-1	2	54		54
	3	340	340	
	4	139	139	
2	2	350	350	
	3	210	210	
	4	144	144	
	5	54		54
3	2	350	350	
	3	354	354	
	6	54		54
4	2	408	408	
	3	153	153	
	5	576	576	
5	2	561	561	
	4	576	576	

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	G	
	2	1	F	
	3	1	E	
B	1	1	K	
	2	1	J	
	3	1	I	
	4	1	H	
C	1	1	O	
	2	1	N	
	3	1	M	
	4	1	L	
D	1	1	D	
	2	1	C	
	3	1	B	
	4	1	A	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)
1	2	2.93	30.00	
	3	2.93	30.00	
	4			15.00
B-1	2			15.00
	3	4.21	30.00	
	4	4.21	30.00	
3	2	2.93	30.00	
	3	2.93	30.00	
	6			15.00
5	2	2.93	30.00	
	4	2.93	30.00	

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Bus Free Running Speed (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	1/4	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
	2	1	1/2	A/2	3.58	30.00		✓	Straight	Straight Movement
	3	1	1/3	A/3	3.58	30.00		✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	11.27	30.00		✓	Nearside	16.65
	2	1	D/1	Ax/2	11.27	30.00		✓	Nearside	17.23
B	1	1	B-1/3	B/1	4.53	30.00		✓	Straight	Straight Movement
	2	1	B-1/3	B/2	4.23	30.00		✓	Straight	Straight Movement
	3	1	B-1/2	B/3			15.00	✓	Straight	Straight Movement
	4	1	B-1/4	B/4	4.18	30.00		✓	Straight	Straight Movement
Bx	1	1	D/1	Bx/1			15.00	✓	Straight	Straight Movement
	2	1	C/4	Bx/2	12.91	30.00		✓	Offside	26.45
	3	1	C/4	Bx/3	12.90	30.00		✓	Offside	26.45
	1	1	4/5	C/1	5.20	30.00		✓	Straight	Straight Movement

C	**2**	**1**	4/5	C/2	4.98	30.00		✓	Straight	Straight Movement
	3	**1**	4/2	C/3	4.98	30.00		✓	Straight	Straight Movement
	4	**1**	4/3	C/4	4.99	30.00		✓	Straight	Straight Movement
Cx	**1**	**1**	A/2	Cx/1	16.12	30.00		✓	Straight	Straight Movement
	2	**1**	A/3	Cx/2	16.12	30.00		✓	Straight	Straight Movement
D	**1**	**1**	2/5	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
	2	**1**	2/2	D/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	2/3	D/3	3.54	30.00		✓	Straight	Straight Movement
	4	**1**	2/4	D/4	3.54	30.00		✓	Straight	Straight Movement
Dx	**1**	**1**	B/2	Dx/1	14.57	30.00		✓	Straight	Straight Movement
	2	**1**	B/3	Dx/2			15.00	✓	Straight	Straight Movement
2	**2**	**1**	3/2	2/2	3.48	30.00		✓	Straight	Straight Movement
	3	**1**	3/3	2/3	3.48	30.00		✓	Straight	Straight Movement
	4	**1**	3/3	2/4	3.60	30.00		✓	Straight	Straight Movement
	5	**1**	3/6	2/5			15.00	✓	Straight	Straight Movement
4	**2**	**1**	5/2	4/2	3.54	30.00		✓	Straight	Straight Movement
	3	**1**	5/2	4/3	3.77	30.00		✓	Straight	Straight Movement
	5	**1**	5/4	4/5	3.54	30.00		✓	Straight	Straight Movement
A	**1**	**2**	1/2	A/1	3.68	30.00	15.00	✓	Straight	Straight Movement
Ax	**1**	**2**	C/2	Ax/1	11.27	30.00		✓	Straight	Straight Movement
	2	**2**	C/3	Ax/2	11.27	30.00		✓	Straight	Straight Movement
Bx	**2**	**2**	D/2	Bx/2	12.91	30.00		✓	Straight	Straight Movement
	3	**2**	D/3	Bx/3	12.90	30.00		✓	Straight	Straight Movement
Cx	**1**	**2**	B/1	Cx/1	16.12	30.00		✓	Nearside	15.08
	2	**2**	B/1	Cx/2	16.12	30.00		✓	Nearside	16.75
D	**1**	**2**	2/2	D/1	3.65	30.00	15.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	14.57	30.00		✓	Nearside	14.66
Ax	**1**	**3**	B/4	Ax/1	11.27	30.00		✓	Offside	29.45
	2	**3**	B/4	Ax/2	11.27	30.00		✓	Offside	26.33
Bx	**2**	**3**	A/1	Bx/2	12.91	30.00		✓	Nearside	16.74
	3	**3**	A/1	Bx/3	12.90	30.00		✓	Nearside	17.18
Cx	**1**	**3**	D/4	Cx/1	16.12	30.00		✓	Offside	28.88
	2	**3**	D/4	Cx/2	16.12	30.00		✓	Offside	27.91
Dx	**1**	**3**	A/3	Dx/1	14.57	30.00		✓	Offside	27.77

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40
5	(untitled)				Farside	3.00	2.00	5.40
6	(untitled)				Farside	3.00	2.00	5.40
7	(untitled)				Farside	3.00	2.00	5.40
8	(untitled)				Farside	3.00	2.00	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	P	
2	1	Q	
3	1	R	
4	1	S	
5	1	T	
6	1	U	
7	1	V	
8	1	W	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Pedestrian Crossing Connectors

Pedestrian Crossing Connectors

Pedestrian crossing connector	Pedestrian crossing1	Pedestrian crossing2	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	2:1	1:1	3.00	2.00	5.40
2	4:1	3:1	3.00	2.00	5.40
3	6:1	5:2	3.00	2.00	5.40
4	8:1	7:2	3.00	2.00	5.40

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	168	816	153	0	0	0	0
	2	144	0	140	420	0	0	0	0
	3	412	0	0	0	0	0	0	0
	4	60	280	139	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	54	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	54	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	5/4, 5/2	Cx/1, Cx/2	#0000FF
	2	(untitled)	3/6, 3/2, 3/3	Dx/2, Dx/1	#FF0000
	3	(untitled)	1/4, 1/2, 1/3	Ax/1, Ax/2	#00FF00
	4	(untitled)	B-1/4, B-1/3, B-1/2	Bx/3, Bx/2, Bx/1	#FFFF00
	5	(untitled)	2:2E, 3:2E	2:2X, 3:2X	#FF00FF
	6	(untitled)	1:2E, 8:2E	1:2X, 8:2X	#008000
	7	(untitled)	4:2E, 5:1E	4:2X, 5:1X	#FFA500
	8	(untitled)	6:2E, 7:1E	6:2X, 7:1X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	4		1	4	5/2, 4/3, C/4, Bx/3	Normal	77
	6		1	4	5/2, 4/3, C/4, Bx/2	Normal	77
	8		1	2	5/4, 4/5, C/1, Dx/1	Normal	168
	10		2	4	3/3, 2/3, D/3, Bx/3	Normal	210
	11		2	4	3/2, 2/2, D/2, Bx/2	Normal	210
	14		3	2	1/3, A/3, Dx/1	Normal	0
	26		2	3	3/2, 2/2, D/1, Ax/1	Normal	70
	27		2	3	3/2, 2/2, D/1, Ax/2	Normal	70
	28		1	3	5/4, 4/5, C/2, Ax/1	Normal	408
	29		1	3	5/2, 4/2, C/3, Ax/2	Normal	408
	30		4	3	B-1/4, B/4, Ax/2	Normal	70
	31		4	3	B-1/4, B/4, Ax/1	Normal	70
	33		3	1	1/3, A/3, Cx/2	Normal	206
	34		3	1	1/2, A/2, Cx/1	Normal	206
	35		4	1	B-1/3, B/1, Cx/1	Normal	30
	36		4	1	B-1/3, B/1, Cx/2	Normal	30
	37		2	1	3/3, 2/4, D/4, Cx/2	Normal	72
	38		2	1	3/3, 2/4, D/4, Cx/1	Normal	72
	40		3	4	1/2, A/1, Bx/2	Normal	0
	41		3	4	1/2, A/1, Bx/3	Normal	0
	42		4	2	B-1/3, B/2, Dx/1	Normal	280

Bus Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Bus Calculated Flow (PCU/hr)
1	12		2	4	3/6, 2/5, D/1, Bx/1	Normal	54
	39		4	2	B-1/2, B/3, Dx/2	Normal	54

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	18		5	6	2:2E, 2:1X, 1:1E, 1:2X	Normal	300
	19		6	5	1:2E, 1:1X, 2:1E, 2:2X	Normal	300
	20		5	7	3:2E, 3:1X, 4:1E, 4:2X	Normal	300
	21		7	5	4:2E, 4:1X, 3:1E, 3:2X	Normal	300
	22		8	7	6:2E, 6:1X, 5:2E, 5:1X	Normal	300
	23		7	8	5:1E, 5:2X, 6:1E, 6:2X	Normal	300
	24		8	6	7:1E, 7:2X, 8:1E, 8:2X	Normal	300
	25		6	8	8:2E, 8:1X, 7:2E, 7:1X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		5	NetworkDefault	120	59

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type	Blackout Time (s)
1	A	(untitled)	7	300	0	0	Unknown	
	B	(untitled)	7	300	0	0	Unknown	
	C	(untitled)	7	300	0	0	Unknown	
	D	(untitled)	7	300	0	0	Unknown	
	E	(untitled)	7	300	0	0	Unknown	
	F	(untitled)	7	300	0	0	Unknown	
	G	(untitled)	7	300	0	0	Unknown	
	H	(untitled)	7	300	0	0	Unknown	
	I	(untitled)	7	300	0	0	Unknown	
	J	(untitled)	7	300	0	0	Unknown	
	K	(untitled)	7	300	0	0	Unknown	
	L	(untitled)	7	300	0	0	Unknown	
	M	(untitled)	7	300	0	0	Unknown	
	N	(untitled)	7	300	0	0	Unknown	
	O	(untitled)	7	300	0	0	Unknown	
	P	(untitled)	7	300	0	0	Pedestrian	0
	Q	(untitled)	7	300	0	0	Pedestrian	0
	R	(untitled)	7	300	0	0	Pedestrian	0
	S	(untitled)	7	300	0	0	Pedestrian	0
	T	(untitled)	7	300	0	0	Pedestrian	0
	U	(untitled)	7	300	0	0	Pedestrian	0
	V	(untitled)	7	300	0	0	Pedestrian	0
	W	(untitled)	7	300	0	0	Pedestrian	0

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	1	O, N, M, L, W, T, R	1	1	100
	2	I, J, K, B, C, D, V, R	1	1	100
	3	A, H, Q, U, R, V	1	1	100
	4	E, F, G, P, V, T, S	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4	16, 44, 66, 89	66	
	2	(untitled)	Single	1, 2, 4, 3	15, 42, 68, 92	68	
	3	(untitled)	Single	1, 3, 2, 4	15, 40, 64, 89	70	
	4	(untitled)	Single	1, 3, 4, 2	15, 40, 63, 89	68	
	5	(untitled)	Single	1, 4, 2, 3	33, 58, 90, 110	59	
	6	(untitled)	Single	1, 4, 3, 2	16, 38, 63, 89	63	

Intergreen Matrix for Controller Stream 1

		To																						
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
From	A					5	5			5	6	10	8	5	5						6			0
	B					6	7		7				5	5	5			0			6			
	C					6	7		5				5	5	5			0			6			
	D					7	8	11	5					5	5			0		11	6			
	E	8	5	5	5				5	7	8	11	7	5	6	11			6			0		0
	F	6	5	5	5				6	8	8	11	5						6					0
	G				5													9	6					
	H		5	5	10	8	5						5	5	5		6			0				
	I	7				5	5						5	6	7		6					0		
	J	5				5	5						6	7	8	11	6					0		
	K	5				5	5										6							10
	L	5	5	5		5	5		9	5	5							0					5	
	M	5	7	7	11	5			6	5	5									0			5	
	N	6	7	8	12	5			6	5	5									0			6	
	O					5					5											10	6	
	P								4	4	4	4												
	Q		5	5	5			5					5											
	R					5	5	5																
	S				4				4					4	4									
	T	1	1	1	1																			
	U					1				1	1					1								
	V												1	1	1	1								
	W	1				1	1					1												

Banned Stage transitions for Controller Stream 1

		To			
		1	2	3	4
From	1				
	2				
	3				
	4				

Interstage Matrix for Controller Stream 1

		To			
		1	2	3	4
From	1	0	12	10	6
	2	11	0	7	11
	3	8	10	0	8
	4	11	11	9	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	1	✓	1	O,N,M,L,W,T,R	118	33	35	1	7
	2	✓	4	E,F,G,P,V,T,S	39	58	19	1	6
	3	✓	2	I,J,K,B,C,D,V,R	69	90	21	1	7
	4	✓	3	A,H,Q,U,R,V	97	110	13	1	7

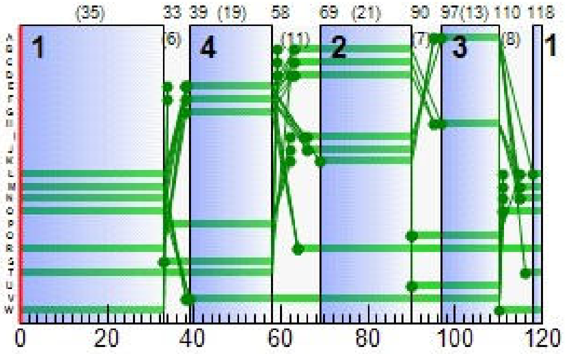
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	97	110	13
	B	1	✓	63	90	27
	C	1	✓	63	90	27
	D	1	✓	63	90	27
	E	1	✓	38	58	20
	F	1	✓	38	58	20
	G	1	✓	38	58	20
	H	1	✓	97	110	13
	I	1	✓	66	90	24
	J	1	✓	66	90	24
	K	1	✓	69	90	21
	L	1	✓	118	33	35
	M	1	✓	115	33	38
	N	1	✓	115	33	38
	O	1	✓	111	33	42
	P	1	✓	33	58	25
	Q	1	✓	90	110	20
	R	1	✓	64	33	89
	S	1	✓	33	58	25
	T	1	✓	116	58	62
	U	1	✓	90	110	20
	V	1	✓	39	110	71
	W	1	✓	110	33	43

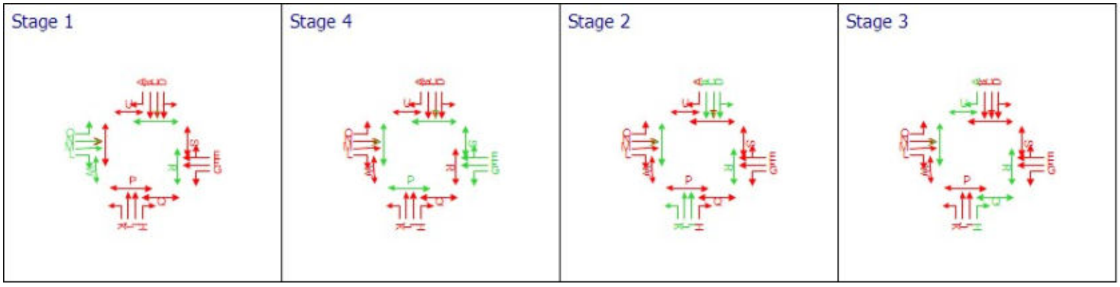
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	G	38	58	20
A	2	1	1	F	38	58	20
A	3	1	1	E	38	58	20
B	1	1	1	K	69	90	21
B	2	1	1	J	66	90	24
B	3	1	1	I	66	90	24
B	4	1	1	H	97	110	13
C	1	1	1	O	111	33	42
C	2	1	1	N	115	33	38
C	3	1	1	M	115	33	38
C	4	1	1	L	118	33	35
D	1	1	1	D	63	90	27
D	2	1	1	C	63	90	27
D	3	1	1	B	63	90	27
D	4	1	1	A	97	110	13

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1 NB	(untitled)	1	1	G	0	1800	20	21.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	F	206 <	1800	20	0.00	65	38	60.25	56.68	100.09	6.96 +
	3	(untitled)	1	1	E	206 <	1800	20	0.00	65	38	60.25	56.68	100.09	6.96 +
Ax	1	(untitled)				548	Unrestricted	120	28.00	0	Unrestricted	11.27	0.00	0.00	0.00
	2	(untitled)				548	Unrestricted	120	28.00	0	Unrestricted	11.27	0.00	0.00	0.00
B	1	(untitled)	1	1	K	60	1800	21	18.00	18	395	47.17	42.64	84.19	1.70
	2	(untitled)	1	1	J	280 <	1800	24	0.00	75	21	62.39	58.17	103.21	9.77 +
	3 B	(untitled)	1	1	I	54	1800	24	22.00	14	525	48.45	39.58	81.06	1.47
	4	(untitled)	1	1	H	140	1800	13	0.00	67	35	71.47	67.29	107.32	5.08
Bx	1 B	(untitled)				54	Unrestricted	120	92.00	0	Unrestricted	27.61	0.00	0.00	0.00
	2	(untitled)				287	Unrestricted	120	50.00	0	Unrestricted	12.91	0.00	0.00	0.00
	3	(untitled)				287	Unrestricted	120	50.00	0	Unrestricted	12.90	0.00	0.00	0.00
C	1	(untitled)	1	1	O	168	1800	42	0.00	26	246	33.43	28.23	69.83	3.97
	2	(untitled)	1	1	N	408 <	1800	38	0.00	70	29	47.31	42.33	91.18	12.58 +
	3	(untitled)	1	1	M	408 <	1800	38	0.00	70	29	47.31	42.33	91.18	12.58 +
	4	(untitled)	1	1	L	154	1800	35	0.00	29	216	38.47	33.48	75.95	3.95
Cx	1	(untitled)				308	Unrestricted	120	51.00	0	Unrestricted	16.12	0.00	0.00	0.00
	2	(untitled)				308	Unrestricted	120	51.00	0	Unrestricted	16.12	0.00	0.00	0.00
D	1 NB	(untitled)	1	1	D	194 <	1800	27	0.00	46	95	47.86	43.19	87.65	5.75 +
	2	(untitled)	1	1	C	210 <	1800	27	0.00	50	80	47.72	44.18	88.84	6.31 +
	3	(untitled)	1	1	B	210 <	1800	27	0.00	50	80	47.72	44.18	88.84	6.31 +
	4	(untitled)	1	1	A	144 <	1800	13	0.00	69	31	72.38	68.84	109.05	5.32 +
Dx	1	(untitled)				448	Unrestricted	120	38.00	0	Unrestricted	14.57	0.00	0.00	0.00
	2 B	(untitled)				54	Unrestricted	120	95.00	0	Unrestricted	31.00	0.00	0.00	0.00
1	2		1			206	1800	120	31.00	11	686	3.06	0.13	0.00	0.01
	3		1			206	1800	120	31.00	11	686	3.06	0.13	0.00	0.01
	4 B		1			0	1800	120	120.00	0	Unrestricted	0.00	0.00	0.00	0.00
B-1	2 B		1			54	1800	120	120.00	3	2900	8.45	0.03	0.00	0.00
	3		1			340	1800	120	47.00	19	376	4.44	0.23	0.00	0.02
	4		1			140	1800	120	0.00	8	1057	4.30	0.08	0.00	0.00
2	2		1			350	1800	120	21.00	19	363	3.72	0.24	0.00	0.02
	3		1			210	1800	120	21.00	12	671	3.61	0.13	0.00	0.01
	4		1			144	1800	120	5.00	8	1025	3.69	0.09	0.00	0.00
	5 B		1			54	1800	120	120.00	3	2900	6.99	0.03	0.00	0.00
3	2		1			350	1800	120	0.00	19	363	3.17	0.24	0.00	0.02
	3		1			354	1800	120	0.00	20	358	3.17	0.24	0.00	0.02
	6 B		1			54	1800	120	120.00	3	2900	5.89	0.03	0.00	0.00
4	2		1			408	1800	120	48.00	23	297	3.83	0.29	0.00	0.03
	3		1			154	1800	120	0.00	9	952	3.86	0.09	0.00	0.00
	5		1			576	1800	120	48.00	32	181	4.01	0.47	0.00	0.08
5	2		1			562	1800	120	0.00	31	188	3.38	0.45	0.00	0.07
	4		1			576	1800	120	0.00	32	181	3.40	0.47	0.00	0.08

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	525.77	54.18	9.70	30.30	6.35	520.44	31.76	0.00	552.20
Bus	21.60	2.68	8.05	1.17	0.07	17.65	0.29	0.00	17.94
Tram									
Pedestrians	34.80	54.53	0.64	47.87	0.00	679.69	0.00	0.00	679.69
TOTAL	582.18	111.39	5.23	79.34	6.42	1217.78	32.05	0.00	1249.82

- *N = at least one source for this link/traffic stream carries normal traffic*
- *B = at least one source for this link/traffic stream carries Bus traffic*
- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 3 - 2028 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 3
Report generation date: 28/04/2022 04:36:26

Summary of network performance

	AM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 3 - 2028 "with development"			
Network	941.77	63.85	90% (TS C/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

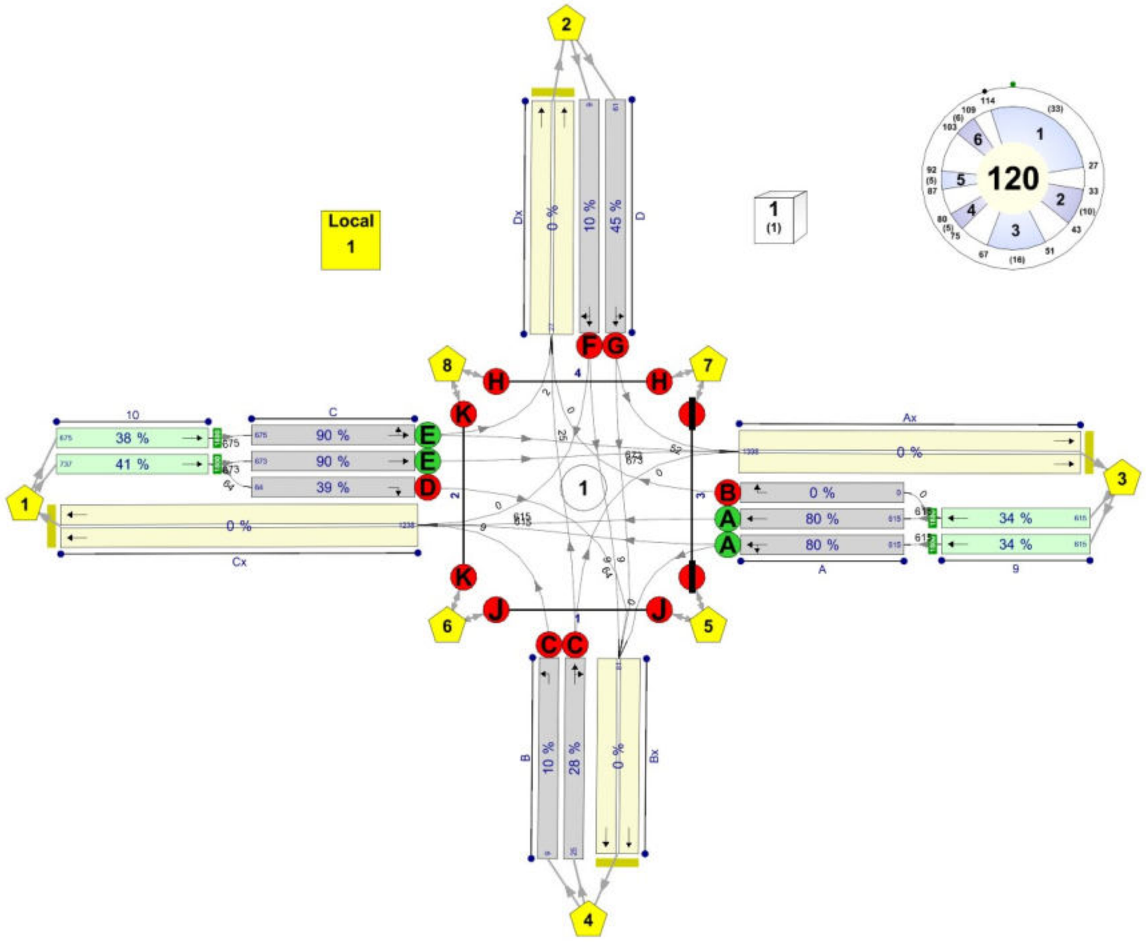
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 3
D1 - 2028 "with development", AM

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 04:34:05	28/04/2022 04:34:09	4.56	08:00	120	941.77	63.85	90.00	C/1	0	0	C/1	10/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 3			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development"	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	193.07						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.92						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.61						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.11						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	615	615
	2	615	615
	3	0	0
Ax	1	1398	1398
B	1	9	9
	2	25	25
Bx	1	81	81
C	1	675	675
	2	673	673
	3	64	64
Cx	1	1238	1238
D	1	61	61
	2	9	9
Dx	1	27	27
9	1	615	615
	2	615	615
10	1	675	675
	2	737	737

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	1	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	1	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	23.17	30.00	✓	Nearside	36.46
Bx	1	1	D/1	Bx/1	17.87	30.00	✓	Straight	Straight Movement
C	1	1	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	1	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	1	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	1	1	D/2	Cx/1	23.83	30.00	✓	Offside	52.80
Dx	1	1	A/3	Dx/1	18.49	30.00	✓	Offside	48.18
Ax	1	2	C/2	Ax/1	23.17	30.00	✓	Straight	Straight Movement
Bx	1	2	A/1	Bx/1	17.87	30.00	✓	Nearside	35.15
Cx	1	2	A/2	Cx/1	23.83	30.00	✓	Straight	Straight Movement
Dx	1	2	C/1	Dx/1	18.49	30.00	✓	Nearside	31.19
Ax	1	3	C/1	Ax/1	23.17	30.00	✓	Straight	Straight Movement
Bx	1	3	C/3	Bx/1	17.87	30.00	✓	Offside	52.02
Cx	1	3	A/1	Cx/1	23.83	30.00	✓	Straight	Straight Movement
Dx	1	3	B/2	Dx/1	18.49	30.00	✓	Straight	Straight Movement
Ax	1	4	B/2	Ax/1	23.17	30.00	✓	Offside	50.08
Bx	1	4	D/2	Bx/1	17.87	30.00	✓	Straight	Straight Movement
Cx	1	4	B/1	Cx/1	23.83	30.00	✓	Nearside	40.07

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	2	1346	64	0	0	0	0
	2	0	0	52	17	0	0	0	0
	3	1229	0	0	0	0	0	0	0
	4	9	25	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	9
	10		2	3	D/1, Ax/1	Normal	52
	11		3	2	9/2, A/3, Dx/1	Normal	0
	12		3	1	9/2, A/2, Cx/1	Normal	615
	13		3	1	9/1, A/1, Cx/1	Normal	615
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Normal	673
	20		1	4	10/2, C/3, Bx/1	Normal	64
	21		1	3	10/1, C/1, Ax/1	Normal	673
	43		4	1	B/1, Cx/1	Normal	9
	44		1	2	10/1, C/1, Dx/1	Normal	2
	45		2	1	D/2, Cx/1	Normal	0
	46		4	2	B/2, Dx/1	Normal	25
	47		4	3	B/2, Ax/1	Normal	0
	48		2	4	D/2, Bx/1	Normal	9

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	120	75

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**(ALL)**	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	E, A	1	1	100
	2	E, D	1	1	100
	3	A, B	1	1	100
	4	F, G	1	1	100
	5	C	1	1	100
	6	H, I, J, K	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 2, 3, 4, 5, 6	27, 43, 67, 80, 92, 109	75	

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	9	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	10	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	10	8	10
	2	8	0	8	10	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	9	9	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	114	27	33	1	5
	2	✓	2	E,D	33	43	10	1	5
	3	✓	3	A,B	51	67	16	1	5
	4	✓	4	F,G	75	80	5	1	5
	5	✓	5	C	87	92	5	1	5
	6	✓	6	H,I,J,K	103	109	6	1	5

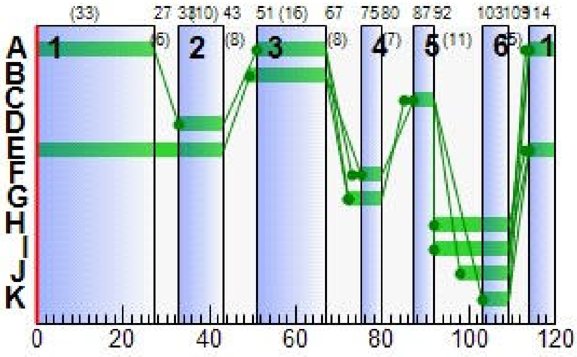
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	51	67	16
		2	✓	114	27	33
	B	1	✓	49	67	18
	C	1	✓	87	92	5
	D	1	✓	33	43	10
	E	1	✓	114	43	49
	F	1	✓	75	80	5
	G	1	✓	72	80	8
	H	1	✓	92	109	17
	I	1	✓	92	109	17
	J	1	✓	98	109	11
	K	1	✓	103	109	6

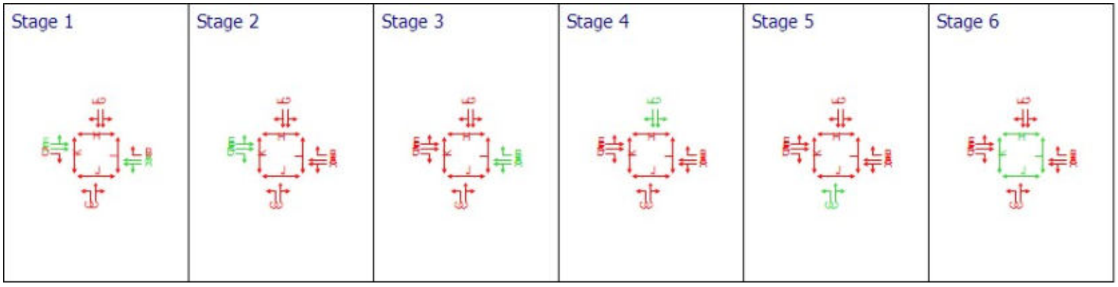
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	1	1	1	A	51	67	16	114	27	33
A	2	1	1	A	51	67	16	114	27	33
A	3	1	1	B	49	67	18			
B	1	1	1	C	87	92	5			
B	2	1	1	C	87	92	5			
C	1	1	1	E	114	43	49			
C	2	1	1	E	114	43	49			
C	3	1	1	D	33	43	10			
D	1	1	1	G	72	80	8			
D	2	1	1	F	75	80	5			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1	(untitled)	1	1	A	615 <	1800	49	0.00	80	24	33.48	26.09	97.96	13.38 +
	2		1	1	A	615 <	1800	49	0.00	80	24	33.48	26.09	97.96	13.38 +
	3		1	1	B	0	1800	18	19.00	0	Unrestricted	0.00	0.00	0.00	0.00
Ax	1	(untitled)				1398	Unrestricted	120	25.00	0	Unrestricted	23.17	0.00	0.00	0.00
B	1	(untitled)	1	1	C	9	1800	5	5.00	10	900	64.24	56.84	95.85	0.29
	2	(untitled)	1	1	C	25	1800	5	4.00	28	260	69.99	62.60	101.09	0.85
Bx	1	(untitled)				82	Unrestricted	120	89.00	0	Unrestricted	17.87	0.00	0.00	0.00
C	1	(untitled)	1	1	E	675 <	1800	49	0.00	90	11	59.54	51.95	106.45	24.43 +
	2		1	1	E	673 <	1800	49	0.00	90	11	59.02	51.43	106.01	24.27 +
	3		1	1	D	64	1800	10	0.00	39	158	66.06	58.17	98.20	2.13
Cx	1	(untitled)				1239	Unrestricted	120	16.00	0	Unrestricted	23.83	0.00	0.00	0.00
D	1	(untitled)	1	1	G	61	1800	8	0.00	45	121	72.53	63.96	102.82	2.11
	2		1	1	F	9	1800	5	5.00	10	900	65.41	56.84	95.85	0.29
Dx	1	(untitled)				27	Unrestricted	120	107.00	0	Unrestricted	18.49	0.00	0.00	0.00
9	1		1			615	1800	120	16.00	34	193	5.97	0.52	0.00	0.09
	2		1			615	1800	120	16.00	34	193	5.97	0.52	0.00	0.09
10	1		1			675	1800	120	72.00	38	167	6.19	0.60	0.00	0.11
	2		1			737	1800	120	71.00	41	144	6.28	0.69	0.00	0.14

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	826.32	59.08	13.99	20.41	11.13	447.83	35.17	0.00	483.00
Bus									
Tram									
Pedestrians	20.40	36.31	0.56	32.31	0.00	458.78	0.00	0.00	458.78
TOTAL	846.72	95.39	8.88	52.72	11.13	906.60	35.17	0.00	941.77

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 3 - 2028 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 3
Report generation date: 28/04/2022 04:39:55

Summary of network performance

	PM			
	PI (£ per hr)	**Total delay (PCU-hr/hr)**	**Highest DOS**	**Number oversaturated**
	Junction 3 - 2028 "with development"			
Network	841.60	57.24	90% (TS C/2)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

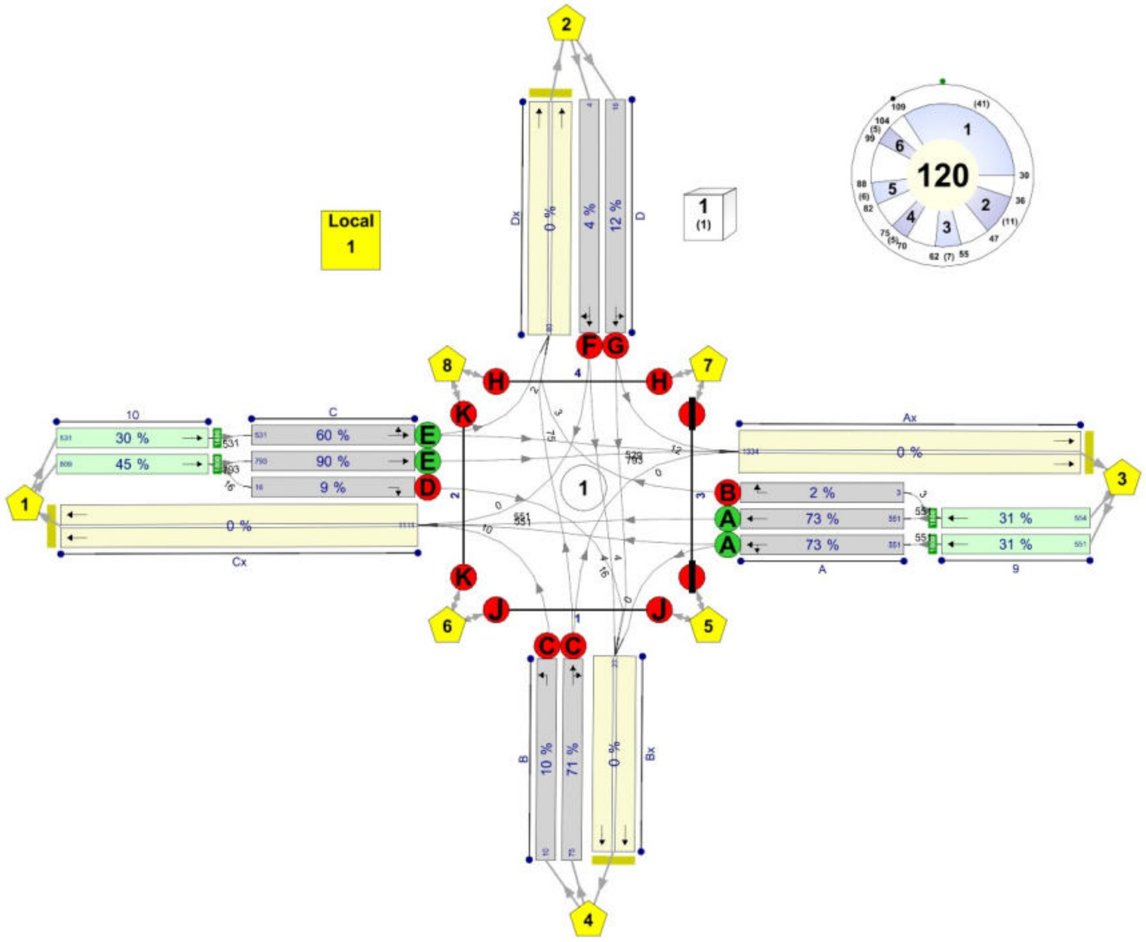
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 3
D1 - 2028 "with development", PM

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 04:37:37	28/04/2022 04:37:42	5.51	17:00	120	841.60	57.24	89.60	C/2	0	0	C/2	10/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 3			✓	D1		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2028 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	193.26						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.24						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.73						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.63						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	551	551
	2	551	551
	3	3	3
Ax	1	1334	1334
B	1	10	10
	2	75	75
Bx	1	23	23
C	1	531	531
	2	793	793
	3	16	16
Cx	1	1111	1111
D	1	16	16
	2	4	4
Dx	1	80	80
9	1	551	551
	2	554	554
10	1	531	531
	2	809	809

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	1	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	1	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	23.19	30.00	✓	Nearside	36.46
Bx	1	1	D/1	Bx/1	17.79	30.00	✓	Straight	Straight Movement
C	1	1	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	1	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	1	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	1	1	D/2	Cx/1	23.85	30.00	✓	Offside	52.80
Dx	1	1	A/3	Dx/1	18.56	30.00	✓	Offside	47.95
Ax	1	2	C/2	Ax/1	23.19	30.00	✓	Straight	Straight Movement
Bx	1	2	A/1	Bx/1	17.79	30.00	✓	Nearside	34.47
Cx	1	2	A/2	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	1	2	C/1	Dx/1	18.56	30.00	✓	Nearside	30.96
Ax	1	3	C/1	Ax/1	23.19	30.00	✓	Straight	Straight Movement
Bx	1	3	C/3	Bx/1	17.79	30.00	✓	Offside	51.34
Cx	1	3	A/1	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	1	3	B/2	Dx/1	18.56	30.00	✓	Straight	Straight Movement
Ax	1	4	B/2	Ax/1	23.19	30.00	✓	Offside	50.69
Bx	1	4	D/2	Bx/1	17.79	30.00	✓	Straight	Straight Movement
Cx	1	4	B/1	Cx/1	23.85	30.00	✓	Nearside	39.46

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	2	1322	16	0	0	0	0
	2	0	0	12	7	0	0	0	0
	3	1101	3	0	0	0	0	0	0
	4	10	75	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	4
	10		2	3	D/1, Ax/1	Normal	12
	11		3	2	9/2, A/3, Dx/1	Normal	3
	12		3	1	9/2, A/2, Cx/1	Normal	551
	13		3	1	9/1, A/1, Cx/1	Normal	551
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Percentage	793
	20		1	4	10/2, C/3, Bx/1	Normal	16
	21		1	3	10/1, C/1, Ax/1	Percentage	529
	43		4	1	B/1, Cx/1	Normal	10
	44		1	2	10/1, C/1, Dx/1	Normal	2
	45		2	1	D/2, Cx/1	Normal	0
	46		2	4	D/2, Bx/1	Normal	4
	47		4	2	B/2, Dx/1	Normal	75
	48		4	3	B/2, Ax/1	Normal	0

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	120	75

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**(ALL)**	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	E, A	1	1	100
	2	E, D	1	1	100
	3	A, B	1	1	100
	4	F, G	1	1	100
	5	C	1	1	100
	6	H, I, J, K	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	**1**	(untitled)	Single	1, 2, 3, 4, 5, 6	30, 47, 62, 75, 88, 104	75	

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	8	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	9	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	9	8	10
	2	8	0	8	9	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	8	8	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	109	30	41	1	5
	2	✓	2	E,D	36	47	11	1	5
	3	✓	3	A,B	55	62	7	1	5
	4	✓	4	F,G	70	75	5	1	5
	5	✓	5	C	82	88	6	1	5
	6	✓	6	H,I,J,K	99	104	5	1	5

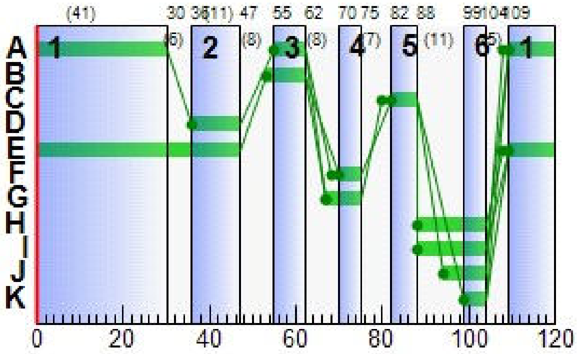
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	55	62	7
		2	✓	109	30	41
	B	**1**	✓	53	62	9
	C	**1**	✓	82	88	6
	D	**1**	✓	36	47	11
	E	**1**	✓	109	47	58
	F	**1**	✓	70	75	5
	G	**1**	✓	67	75	8
	H	**1**	✓	88	104	16
	I	**1**	✓	88	104	16
	J	**1**	✓	94	104	10
	K	**1**	✓	99	104	5

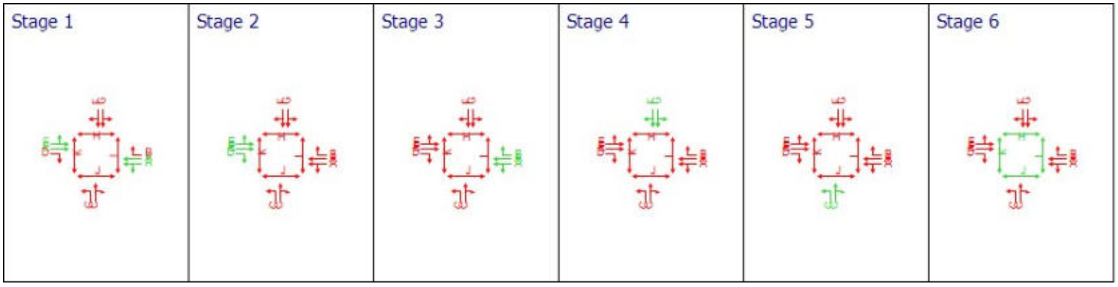
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	**1**	1	1	A	55	62	7	109	30	41
A	**2**	1	1	A	55	62	7	109	30	41
A	**3**	1	1	B	53	62	9			
B	**1**	1	1	C	82	88	6			
B	**2**	1	1	C	82	88	6			
C	**1**	1	1	E	109	47	58			
C	**2**	1	1	E	109	47	58			
C	**3**	1	1	D	36	47	11			
D	**1**	1	1	G	67	75	8			
D	**2**	1	1	F	70	75	5			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1	(untitled)	1	1	A	551 <	1800	48	0.00	73	23	33.32	25.94	87.30	12.31 +
	2		1	1	A	551 <	1800	48	0.00	73	23	33.32	25.94	87.30	12.31 +
	3		1	1	B	3	1800	9	9.00	2	4400	58.89	51.12	90.68	0.00
Ax	1	(untitled)				1334	Unrestricted	120	30.00	0	Unrestricted	23.19	0.00	0.00	0.00
B	1	(untitled)	1	1	C	10	1800	6	6.00	10	845	62.87	55.48	94.68	0.32
	2	(untitled)	1	1	C	75	1800	6	0.00	71	26	101.84	94.45	126.45	3.25
Bx	1	(untitled)				24	Unrestricted	120	102.00	0	Unrestricted	17.79	0.00	0.00	0.00
C	1	(untitled)	1	1	E	531 <	1800	58	0.00	60	50	32.62	25.03	72.70	13.13 +
	2		1	1	E	793 <	1800	58	0.00	90	0	51.30	43.71	101.21	27.31 +
	3		1	1	D	16	1800	11	11.00	9	913	57.91	50.02	89.82	0.48
Cx	1	(untitled)				1112	Unrestricted	120	18.00	0	Unrestricted	23.85	0.00	0.00	0.00
D	1	(untitled)	1	1	G	16	1800	8	8.00	12	659	62.16	53.59	93.00	0.50
	2		1	1	F	4	1800	5	5.00	4	1925	64.13	55.55	94.79	0.13
Dx	1	(untitled)				80	Unrestricted	120	99.00	0	Unrestricted	18.56	0.00	0.00	0.00
9	1		1			551	1800	120	11.00	31	194	5.90	0.44	0.00	0.07
	2		1			554	1800	120	11.00	31	192	5.90	0.44	0.00	0.07
10	1		1			531	1800	120	15.00	30	205	6.00	0.42	0.00	0.06
	2		1			809	1800	120	75.00	45	100	6.40	0.82	0.00	0.18

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	766.87	49.89	15.37	17.15	7.18	345.44	28.72	0.00	374.16
Bus									
Tram									
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	787.27	86.81	9.07	50.06	7.18	812.88	28.72	0.00	841.60

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 3 - 2040 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 3
Report generation date: 28/04/2022 04:42:59

Summary of network performance

	AM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 3 - 2040 "with development"			
Network	917.63	62.49	81% (TS C/1)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

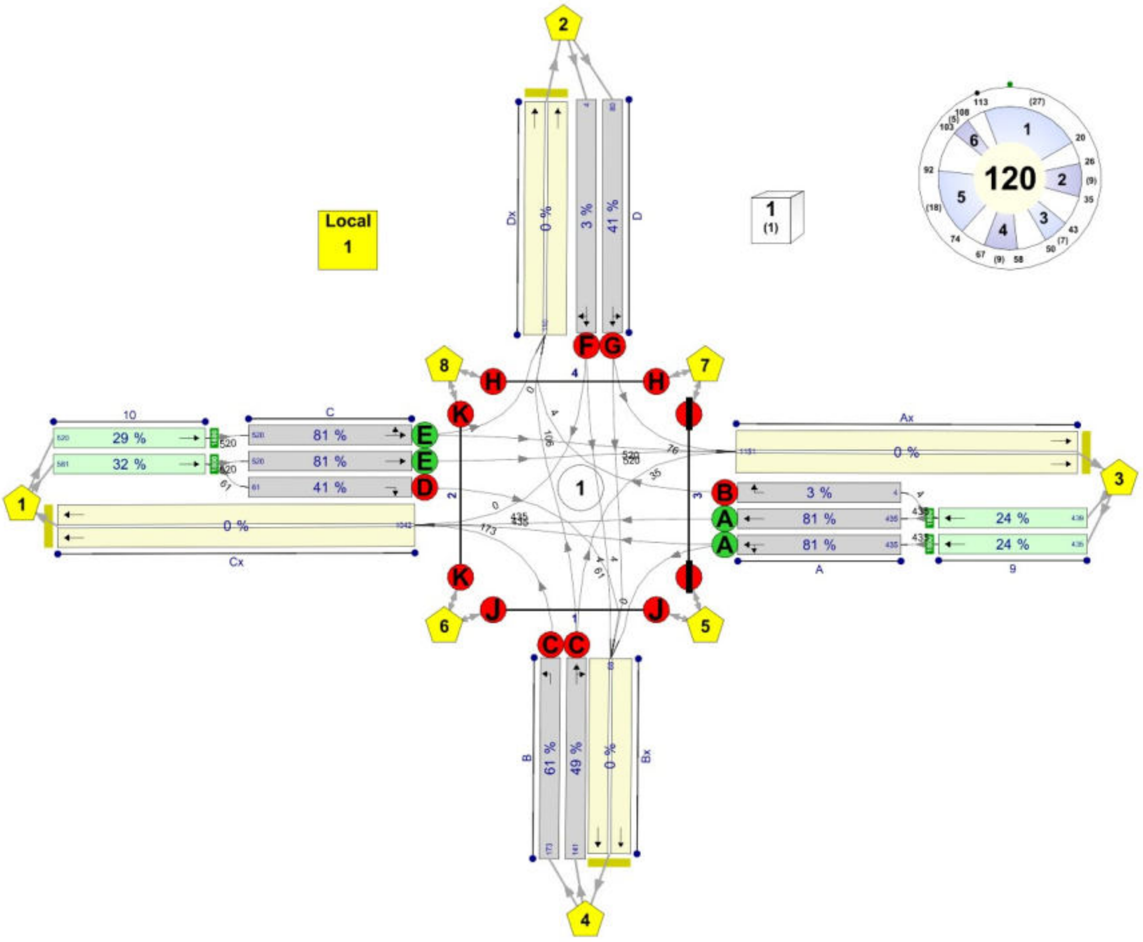
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 3
D2 - 2040 "with development", AM

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 04:40:58	28/04/2022 04:41:01	3.75	08:00	120	917.63	62.49	80.62	C/1	0	0	C/1	10/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 3			✓	D2		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development"	AM	(untitled)			08:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	192.83						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.83						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	199.09						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.64						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	**1**	435	435
	2	435	435
	3	4	4
Ax	**1**	1151	1151
B	**1**	173	173
	2	141	141
Bx	**1**	68	68
C	**1**	520	520
	2	520	520
	3	61	61
Cx	**1**	1042	1042
D	**1**	80	80
	2	4	4
Dx	**1**	110	110
9	**1**	435	435
	2	439	439
10	**1**	520	520
	2	581	581

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	**1**	1	A	
	2	1	A	
	3	1	B	
B	**1**	1	C	
	2	1	C	
C	**1**	1	E	
	2	1	E	
	3	1	D	
D	**1**	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	**1**	7.40	30.00
	2	7.40	30.00
D	**1**	8.57	30.00
	2	8.57	30.00
9	**1**	5.45	30.00
	2	5.45	30.00
10	**1**	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	**1**	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	D/1	Ax/1	23.14	30.00	✓	Nearside	36.46
Bx	**1**	**1**	D/1	Bx/1	17.86	30.00	✓	Straight	Straight Movement
C	**1**	**1**	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	**1**	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	**1**	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	D/2	Cx/1	23.89	30.00	✓	Offside	52.80
Dx	**1**	**1**	A/3	Dx/1	18.56	30.00	✓	Offside	47.95
Ax	**1**	**2**	C/2	Ax/1	23.14	30.00	✓	Straight	Straight Movement
Bx	**1**	**2**	A/1	Bx/1	17.86	30.00	✓	Nearside	35.16
Cx	**1**	**2**	A/2	Cx/1	23.89	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	18.56	30.00	✓	Nearside	30.95
Ax	**1**	**3**	C/1	Ax/1	23.14	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	C/3	Bx/1	17.86	30.00	✓	Offside	52.04
Cx	**1**	**3**	A/1	Cx/1	23.89	30.00	✓	Straight	Straight Movement
Dx	**1**	**3**	B/2	Dx/1	18.56	30.00	✓	Straight	Straight Movement
Ax	**1**	**4**	B/2	Ax/1	23.14	30.00	✓	Offside	48.69
Bx	**1**	**4**	D/2	Bx/1	17.86	30.00	✓	Straight	Straight Movement
Cx	**1**	**4**	B/1	Cx/1	23.89	30.00	✓	Nearside	40.34

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	1040	61	0	0	0	0
	2	0	0	76	7	0	0	0	0
	3	869	4	0	0	0	0	0	0
	4	173	106	35	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	4
	10		2	3	D/1, Ax/1	Normal	76
	11		3	2	9/2, A/3, Dx/1	Normal	4
	12		3	1	9/2, A/2, Cx/1	Normal	435
	13		3	1	9/1, A/1, Cx/1	Normal	435
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Normal	520
	20		1	4	10/2, C/3, Bx/1	Normal	61
	21		1	3	10/1, C/1, Ax/1	Normal	520
	24		4	2	B/2, Dx/1	Normal	106
	43		4	1	B/1, Cx/1	Normal	173
	44		1	2	10/1, C/1, Dx/1	Normal	0
	45		2	1	D/2, Cx/1	Normal	0
	46		4	3	B/2, Ax/1	Normal	35
	47		2	4	D/2, Bx/1	Normal	4

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	120	92

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**A**	(untitled)	5	300	0	0	Unknown
	B	(untitled)	5	300	0	0	Unknown
	C	(untitled)	18	300	0	0	Unknown
	D	(untitled)	5	300	0	0	Unknown
	E	(untitled)	5	300	0	0	Unknown
	F	(untitled)	9	300	0	0	Unknown
	G	(untitled)	9	300	0	0	Unknown
	H	(untitled)	5	300	0	0	Unknown
	I	(untitled)	5	300	0	0	Unknown
	J	(untitled)	5	300	0	0	Unknown
	K	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	E, A	1	1	100
	2	E, D	1	1	100
	3	A, B	1	1	100
	4	F, G	1	1	100
	5	C	1	1	100
	6	H, I, J, K	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6	20, 35, 50, 67, 92, 108	92	

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	9	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	10	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	10	8	10
	2	8	0	8	10	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	9	9	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	113	20	27	1	5
	2	✓	2	E,D	26	35	9	1	5
	3	✓	3	A,B	43	50	7	1	5
	4	✓	4	F,G	58	67	9	1	9
	5	✓	5	C	74	92	18	1	18
	6	✓	6	H,I,J,K	103	108	5	1	5

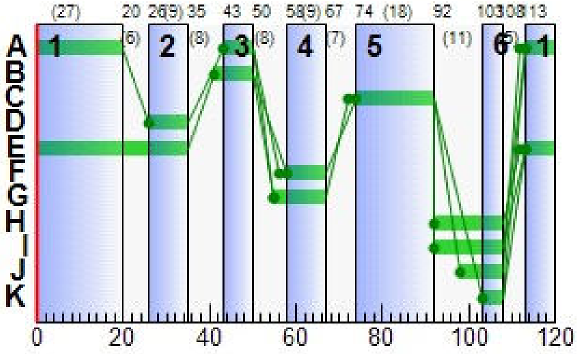
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	43	50	7
		2	✓	113	20	27
	B	**1**	✓	41	50	9
	C	**1**	✓	74	92	18
	D	**1**	✓	26	35	9
	E	**1**	✓	113	35	42
	F	**1**	✓	58	67	9
	G	**1**	✓	55	67	12
	H	**1**	✓	92	108	16
	I	**1**	✓	92	108	16
	J	**1**	✓	98	108	10
	K	**1**	✓	103	108	5

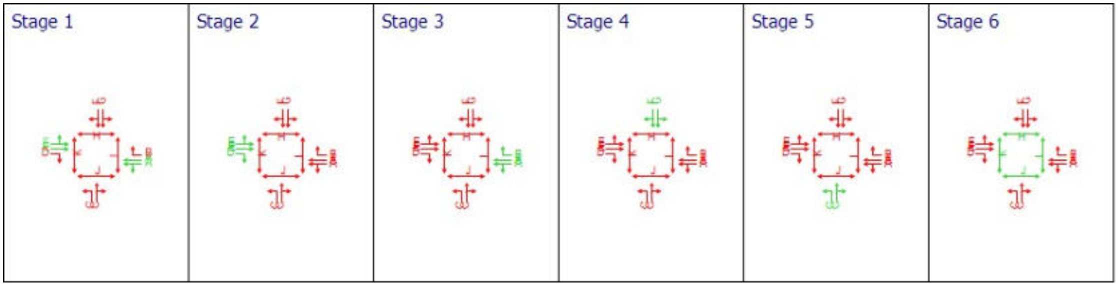
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	**1**	1	1	A	43	50	7	113	20	27
A	**2**	1	1	A	43	50	7	113	20	27
A	**3**	1	1	B	41	50	9			
B	**1**	1	1	C	74	92	18			
B	**2**	1	1	C	74	92	18			
C	**1**	1	1	E	113	35	42			
C	**2**	1	1	E	113	35	42			
C	**3**	1	1	D	26	35	9			
D	**1**	1	1	G	55	67	12			
D	**2**	1	1	F	58	67	9			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	A	435 <	1800	34	0.00	81	24	44.38	36.99	109.29	11.38 +
	2		1	1	A	435 <	1800	34	0.00	81	24	44.38	36.99	109.29	11.38 +
	3		1	1	B	4	1800	9	9.00	3	3650	58.98	51.20	90.95	0.12
Ax	**1**	(untitled)				1151	Unrestricted	120	16.00	0	Unrestricted	23.14	0.00	0.00	0.00
B	**1**	(untitled)	1	1	C	173	1800	18	0.00	61	65	64.00	56.60	99.32	5.79
	2	(untitled)	1	1	C	141	1800	18	0.00	49	102	59.65	52.25	94.87	4.51
Bx	**1**	(untitled)				69	Unrestricted	120	95.00	0	Unrestricted	17.86	0.00	0.00	0.00
C	**1**	(untitled)	1	1	E	520 <	1800	42	0.00	81	24	53.51	45.92	97.40	17.21 +
	2		1	1	E	520 <	1800	42	0.00	81	24	53.51	45.92	97.40	17.21 +
	3		1	1	D	61	1800	9	0.00	41	146	68.21	60.33	99.84	2.05
Cx	**1**	(untitled)				1043	Unrestricted	120	4.00	0	Unrestricted	23.89	0.00	0.00	0.00
D	**1**	(untitled)	1	1	G	80	1800	12	0.00	41	144	64.86	56.29	96.75	2.61
	2		1	1	F	4	1800	9	9.00	3	3650	59.78	51.20	90.95	0.12
Dx	**1**	(untitled)				110	Unrestricted	120	91.00	0	Unrestricted	18.56	0.00	0.00	0.00
9	**1**		1			435	1800	120	6.00	24	314	5.77	0.32	0.00	0.04
	2		1			439	1800	120	6.00	24	310	5.78	0.32	0.00	0.04
10	**1**		1			520	1800	120	43.00	29	246	5.99	0.41	0.00	0.06
	2		1			581	1800	120	43.00	32	210	6.06	0.48	0.00	0.08

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	696.84	52.80	13.20	21.96	7.61	419.91	30.28	0.00	450.19
Bus									
Tram									
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	717.24	89.72	7.99	54.88	7.61	887.35	30.28	0.00	917.63

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 16

Version: 16.0.1.8473

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 3 - 2040 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 3
Report generation date: 28/04/2022 04:45:56

Summary of network performance

	PM			
	PI (£ per hr)	Total delay (PCU-hr/hr)	Highest DOS	Number oversaturated
	Junction 3 - 2040 "with development"			
Network	845.04	57.66	88% (TS C/2)	0 (0%)

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display OD matrix distances	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber	c m
			✓			✓		✓	✓						

Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

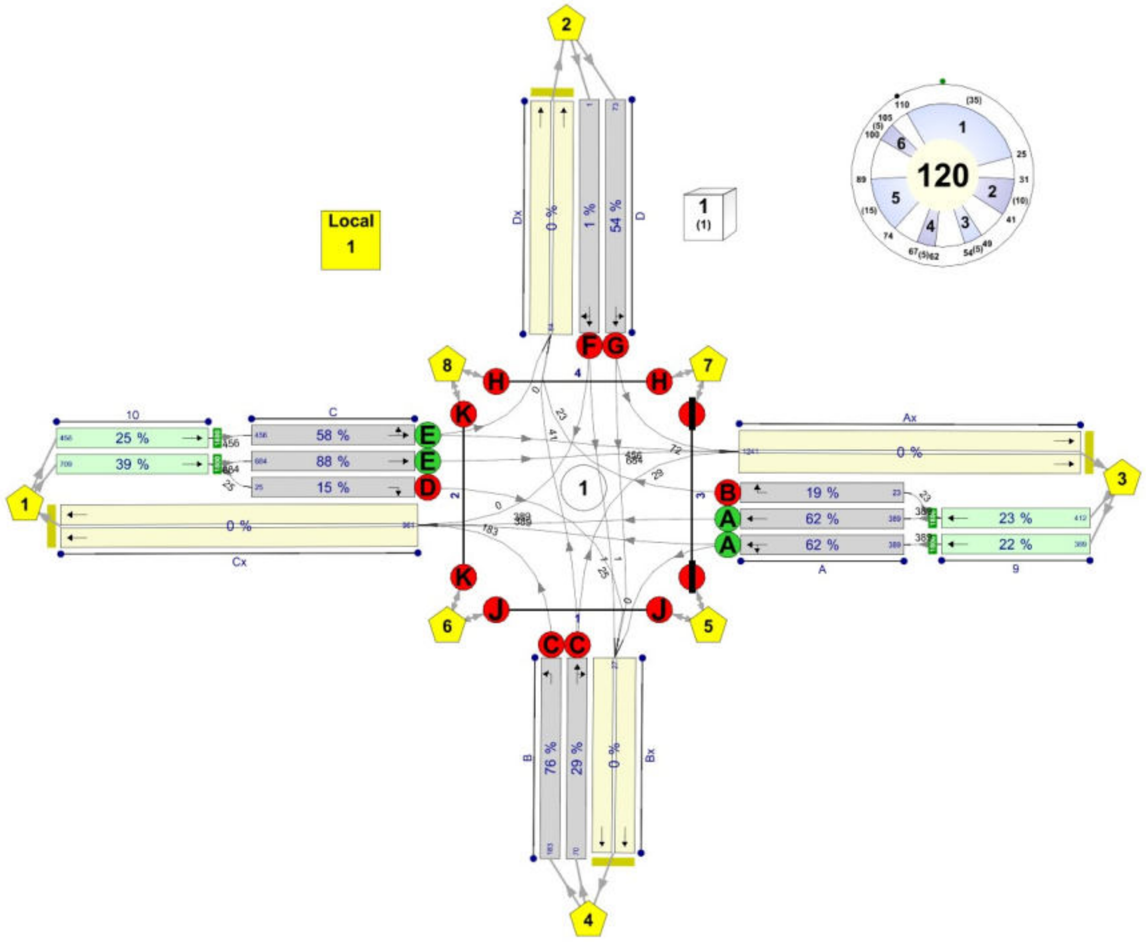
Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Simulation options

Criteria type	Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Average animation capture interval (s)	Use quick response	Do flow sampling	Uniform vehicle generation	Last run random seed	Last run number of trials	Last run time taken (s)
Delay	1.00	10000	10000	-1	3	60	✓			0	0	0.00

Network Diagrams



(untitled)
Diagram produced using TRANSYT 16.0.1.8473

A1 - Junction 3
D2 - 2040 "with development", PM

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Run duration (s)	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item wi wors unsignal PRC
1	28/04/2022 04:43:56	28/04/2022 04:44:00	4.33	17:00	120	845.04	57.66	87.69	C/2	0	0	C/2	10/2

Analysis Set Details

Name	Use Simulation	Description	Use specific Demand Set(s)	Specific Demand Set(s)	Optimise specific Demand Set(s)	Include in report	Locked
Junction 3			✓	D2		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
2040 "with development"	PM	(untitled)			17:00		✓

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	192.95						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.63						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.79						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.72						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	389	389
	2	389	389
	3	23	23
Ax	1	1241	1241
B	1	183	183
	2	70	70
Bx	1	27	27
C	1	456	456
	2	684	684
	3	25	25
Cx	1	961	961
D	1	73	73
	2	1	1
Dx	1	64	64
9	1	389	389
	2	412	412
10	1	456	456
	2	709	709

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	**1**	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	D/1	Ax/1	23.15	30.00	✓	Nearside	36.46
Bx	**1**	**1**	D/1	Bx/1	17.84	30.00	✓	Straight	Straight Movement
C	**1**	**1**	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	**1**	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	**1**	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	D/2	Cx/1	23.85	30.00	✓	Offside	52.80
Dx	**1**	**1**	A/3	Dx/1	18.57	30.00	✓	Offside	48.16
Ax	**1**	**2**	C/2	Ax/1	23.15	30.00	✓	Straight	Straight Movement
Bx	**1**	**2**	A/1	Bx/1	17.84	30.00	✓	Nearside	34.92
Cx	**1**	**2**	A/2	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	18.57	30.00	✓	Nearside	31.17
Ax	**1**	**3**	C/1	Ax/1	23.15	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	C/3	Bx/1	17.84	30.00	✓	Offside	51.79
Cx	**1**	**3**	A/1	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	**1**	**3**	B/2	Dx/1	18.57	30.00	✓	Straight	Straight Movement
Ax	**1**	**4**	B/2	Ax/1	23.15	30.00	✓	Offside	49.38
Bx	**1**	**4**	D/2	Bx/1	17.84	30.00	✓	Straight	Straight Movement
Cx	**1**	**4**	B/1	Cx/1	23.85	30.00	✓	Nearside	40.34

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit	Limit paths by flow	Low path flow threshold
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25				

Normal Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	1140	25	0	0	0	0
	2	0	0	72	2	0	0	0	0
	3	778	23	0	0	0	0	0	0
	4	183	41	29	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	1
	10		2	3	D/1, Ax/1	Normal	72
	11		3	2	9/2, A/3, Dx/1	Normal	23
	12		3	1	9/2, A/2, Cx/1	Normal	389
	13		3	1	9/1, A/1, Cx/1	Normal	389
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Percentage	684
	20		1	4	10/2, C/3, Bx/1	Normal	25
	21		1	3	10/1, C/1, Ax/1	Percentage	456
	24		4	2	B/2, Dx/1	Normal	41
	43		4	1	B/1, Cx/1	Normal	183
	44		1	2	10/1, C/1, Dx/1	Normal	0
	45		2	1	D/2, Cx/1	Normal	0
	46		4	3	B/2, Ax/1	Normal	29
	47		2	4	D/2, Bx/1	Normal	1

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)	Minimum possible cycle time (s)
1	(untitled)		1	NetworkDefault	120	85

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**A**	(untitled)	5	300	0	0	Unknown
	B	(untitled)	5	300	0	0	Unknown
	C	(untitled)	15	300	0	0	Unknown
	D	(untitled)	5	300	0	0	Unknown
	E	(untitled)	5	300	0	0	Unknown
	F	(untitled)	5	300	0	0	Unknown
	G	(untitled)	5	300	0	0	Unknown
	H	(untitled)	5	300	0	0	Unknown
	I	(untitled)	5	300	0	0	Unknown
	J	(untitled)	5	300	0	0	Unknown
	K	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)	Run every N cycles	Probability of running (%)
1	**1**	E, A	1	1	100
	2	E, D	1	1	100
	3	A, B	1	1	100
	4	F, G	1	1	100
	5	C	1	1	100
	6	H, I, J, K	1	1	100

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends	Minimum possible cycle time (s)	Exclude from analysis
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6	25, 41, 54, 67, 89, 105	85	

Intergreen Matrix for Controller Stream 1

		To										
		A	B	C	D	E	F	G	H	I	J	K
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	8	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	9	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	2	3	4	5	6
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	9	8	10
	2	8	0	8	9	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	8	8	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	110	25	35	1	5
	2	✓	2	E,D	31	41	10	1	5
	3	✓	3	A,B	49	54	5	1	5
	4	✓	4	F,G	62	67	5	1	5
	5	✓	5	C	74	89	15	1	15
	6	✓	6	H,I,J,K	100	105	5	1	5

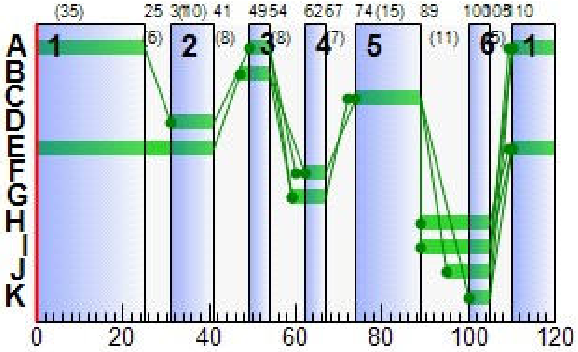
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	49	54	5
		2	✓	110	25	35
	B	**1**	✓	47	54	7
	C	**1**	✓	74	89	15
	D	**1**	✓	31	41	10
	E	**1**	✓	110	41	51
	F	**1**	✓	62	67	5
	G	**1**	✓	59	67	8
	H	**1**	✓	89	105	16
	I	**1**	✓	89	105	16
	J	**1**	✓	95	105	10
	K	**1**	✓	100	105	5

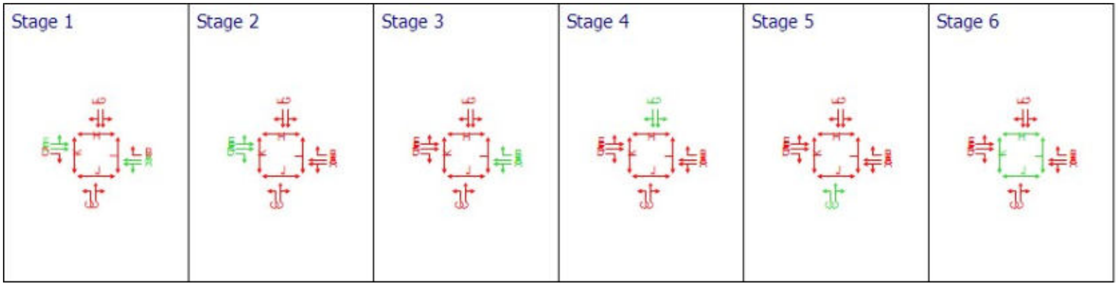
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	**1**	1	1	A	49	54	5	110	25	35
A	**2**	1	1	A	49	54	5	110	25	35
A	**3**	1	1	B	47	54	7			
B	**1**	1	1	C	74	89	15			
B	**2**	1	1	C	74	89	15			
C	**1**	1	1	E	110	41	51			
C	**2**	1	1	E	110	41	51			
C	**3**	1	1	D	31	41	10			
D	**1**	1	1	G	59	67	8			
D	**2**	1	1	F	62	67	5			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	A	389	1800	40	0.00	62	62	31.57	24.19	84.01	8.19
	2		1	1	A	389	1800	40	0.00	62	62	31.57	24.19	84.01	8.19
	3		1	1	B	23	1800	7	6.00	19	422	64.34	56.56	96.11	0.74
Ax	**1**	(untitled)				1241	Unrestricted	120	16.00	0	Unrestricted	23.15	0.00	0.00	0.00
B	**1**	(untitled)	1	1	C	183	1800	15	0.00	76	31	80.14	72.74	112.78	6.99
	2	(untitled)	1	1	C	70	1800	15	0.00	29	243	57.38	49.98	91.51	2.16
Bx	**1**	(untitled)				27	Unrestricted	120	107.00	0	Unrestricted	17.84	0.00	0.00	0.00
C	**1**	(untitled)	1	1	E	456 <	1800	51	0.00	58	71	36.63	29.03	76.60	11.94 +
	2		1	1	E	684 <	1800	51	0.00	88	14	53.92	46.32	101.49	23.61 +
	3		1	1	D	25	1800	10	9.00	15	560	60.10	52.22	92.29	0.78
Cx	**1**	(untitled)				961	Unrestricted	120	5.00	0	Unrestricted	23.85	0.00	0.00	0.00
D	**1**	(untitled)	1	1	G	73	1800	8	0.00	54	85	77.38	68.81	107.18	2.64
	2		1	1	F	1	1800	5	5.00	1	8900	63.42	54.85	94.01	0.00
Dx	**1**	(untitled)				64	Unrestricted	120	88.00	0	Unrestricted	18.57	0.00	0.00	0.00
9	**1**		1			389	1800	120	0.00	22	363	5.73	0.28	0.00	0.03
	2		1			412	1800	120	0.00	23	337	5.75	0.30	0.00	0.03
10	**1**		1			456	1800	120	8.00	25	295	5.93	0.34	0.00	0.04
	2		1			709	1800	120	67.00	39	154	6.24	0.65	0.00	0.13

Network Results

	Distance travelled (PCU-km/hr)	**Time spent (PCU-hr/hr)**	**Mean journey speed (kph)**	**Uniform delay (PCU-hr/hr)**	**Random plus oversat delay (PCU-hr/hr)**	**Weighted cost of delay (£ per hr)**	**Weighted cost of stops (£ per hr)**	**Excess queue penalty (£ per hr)**	**Performance Index (£ per hr)**
Normal traffic	679.08	47.38	14.33	18.66	6.08	351.37	26.23	0.00	377.60
Bus									
Tram									
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	699.48	84.30	8.30	51.58	6.08	818.81	26.23	0.00	845.04

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 4 - 2028 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 4.1
Report generation date: 29/04/2022 14:53:29

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber
			✓		✓		✓	✓					

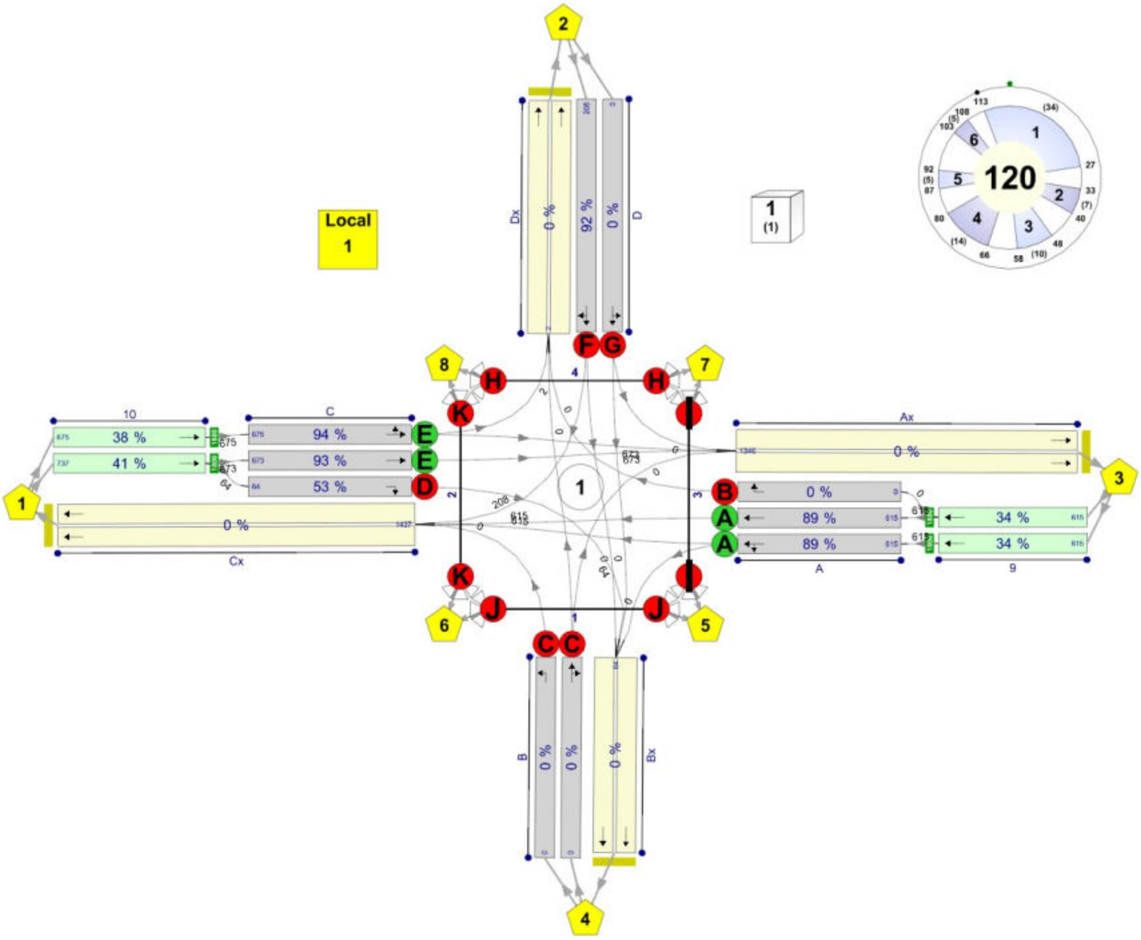
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



(untitled)
Diagram produced using TRANSYT 15.5.2.7994

A1 - Junction 4
D1 - 2028 "with development", AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	29/04/2022 14:51:38	29/04/2022 14:51:39	08:00	120	1160.55	78.73	93.75	C/1	0	0	C/1	10/2	C/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
Junction 4		D1	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2028 "with development", AM	(untitled)			08:00	

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	193.07						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.92						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.61						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.11						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	615	615
	2	615	615
	3	0	0
Ax	1	1346	1346
B	1	0	0
	2	0	0
Bx	1	64	64
C	1	675	675
	2	673	673
	3	64	64
Cx	1	1437	1437
D	1	0	0
	2	208	208
Dx	1	2	2
9	1	615	615
	2	615	615
10	1	675	675
	2	737	737

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	1	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	1	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	23.17	30.00	✓	Nearside	36.46
Bx	1	1	D/1	Bx/1	17.87	30.00	✓	Straight	Straight Movement
C	1	1	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	1	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	1	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	1	1	D/2	Cx/1	23.83	30.00	✓	Offside	52.80
Dx	1	1	A/3	Dx/1	18.49	30.00	✓	Offside	48.18
Ax	1	2	C/2	Ax/1	23.17	30.00	✓	Straight	Straight Movement
Bx	1	2	A/1	Bx/1	17.87	30.00	✓	Nearside	35.15
Cx	1	2	A/2	Cx/1	23.83	30.00	✓	Straight	Straight Movement
Dx	1	2	C/1	Dx/1	18.49	30.00	✓	Nearside	31.19
Ax	1	3	C/1	Ax/1	23.17	30.00	✓	Straight	Straight Movement
Bx	1	3	C/3	Bx/1	17.87	30.00	✓	Offside	52.02
Cx	1	3	A/1	Cx/1	23.83	30.00	✓	Straight	Straight Movement
Dx	1	3	B/2	Dx/1	18.49	30.00	✓	Straight	Straight Movement
Ax	1	4	B/2	Ax/1	23.17	30.00	✓	Offside	50.08
Bx	1	4	D/2	Bx/1	17.87	30.00	✓	Straight	Straight Movement
Cx	1	4	B/1	Cx/1	23.83	30.00	✓	Nearside	40.07

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25		

Normal Input Flows (PCU/hr)

	To								
		1	2	3	4	5	6	7	8
From	1	0	2	1346	64	0	0	0	0
	2	208	0	0	0	0	0	0	0
	3	1229	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

	To								
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	0
	10		2	3	D/1, Ax/1	Normal	0
	11		3	2	9/2, A/3, Dx/1	Normal	0
	12		3	1	9/2, A/2, Cx/1	Normal	615
	13		3	1	9/1, A/1, Cx/1	Normal	615
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Normal	673
	20		1	4	10/2, C/3, Bx/1	Normal	64
	21		1	3	10/1, C/1, Ax/1	Normal	673
	43		4	1	B/1, Cx/1	Normal	0
	44		1	2	10/1, C/1, Dx/1	Normal	2
	45		2	1	D/2, Cx/1	Normal	208
	46		4	2	B/2, Dx/1	Normal	0
	47		4	3	B/2, Ax/1	Normal	0
	48		2	4	D/2, Bx/1	Normal	0

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**(ALL)**	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	**1**	E, A	1
	2	E, D	1
	3	A, B	1
	4	F, G	1
	5	C	1
	6	H, I, J, K	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	**1**	(untitled)	Single	1, 2, 3, 4, 5, 6	27, 40, 58, 80, 92, 108

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	9	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	10	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	10	8	10
	2	8	0	8	10	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	9	9	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	113	27	34	1	5
	2	✓	2	E,D	33	40	7	1	5
	3	✓	3	A,B	48	58	10	1	5
	4	✓	4	F,G	66	80	14	1	5
	5	✓	5	C	87	92	5	1	5
	6	✓	6	H,I,J,K	103	108	5	1	5

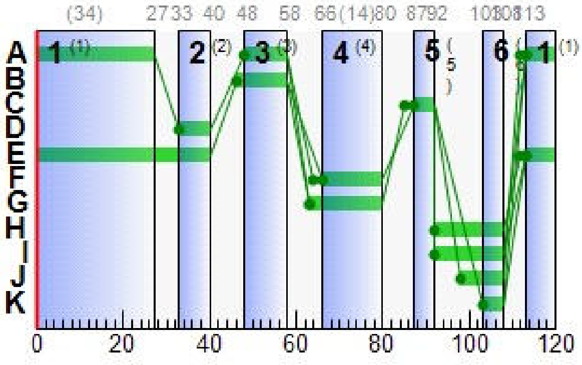
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	48	58	10
		2	✓	113	27	34
	B	1	✓	46	58	12
	C	1	✓	87	92	5
	D	1	✓	33	40	7
	E	1	✓	113	40	47
	F	1	✓	66	80	14
	G	1	✓	63	80	17
	H	1	✓	92	108	16
	I	1	✓	92	108	16
	J	1	✓	98	108	10
	K	1	✓	103	108	5

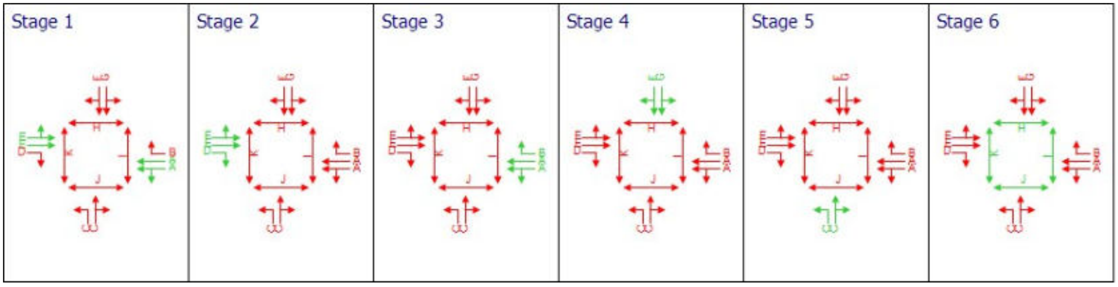
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	1	1	1	A	48	58	10	113	27	34
A	2	1	1	A	48	58	10	113	27	34
A	3	1	1	B	46	58	12			
B	1	1	1	C	87	92	5			
B	2	1	1	C	87	92	5			
C	1	1	1	E	113	40	47			
C	2	1	1	E	113	40	47			
C	3	1	1	D	33	40	7			
D	1	1	1	G	63	80	17			
D	2	1	1	F	66	80	14			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	A	615 <	1800	44	0.00	89	12	47.62	40.24	119.01	17.13 +
	2		1	1	A	615 <	1800	44	0.00	89	12	47.62	40.24	119.01	17.13 +
	3		1	1	B	0	1800	12	13.00	0	Unrestricted	0.00	0.00	0.00	0.00
Ax	**1**	(untitled)				1346	Unrestricted	120	47.00	0	Unrestricted	23.17	0.00	0.00	0.00
B	**1**	(untitled)	1	1	C	0	1800	5	6.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	C	0	1800	5	6.00	0	Unrestricted	0.00	0.00	0.00	0.00
Bx	**1**	(untitled)				64	Unrestricted	120	101.00	0	Unrestricted	17.87	0.00	0.00	0.00
C	**1**	(untitled)	1	1	E	675 <	1800	47	0.00	94	7	71.35	63.75	116.65	27.04 +
	2		1	1	E	673 <	1800	47	0.00	93	7	70.40	62.81	115.76	26.60 +
	3		1	1	D	64	1800	7	0.00	53	88	78.74	70.86	108.96	2.36
Cx	**1**	(untitled)				1438	Unrestricted	120	10.00	0	Unrestricted	23.83	0.00	0.00	0.00
D	**1**	(untitled)	1	1	G	0	1800	17	18.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2		1	1	F	208	1800	14	0.00	92	8	124.12	115.54	143.86	10.49
Dx	**1**	(untitled)				2	Unrestricted	120	120.00	0	Unrestricted	18.49	0.00	0.00	0.00
9	**1**		1			615	1800	120	38.00	34	193	5.97	0.52	0.00	0.09
	2		1			615	1800	120	38.00	34	193	5.97	0.52	0.00	0.09
10	**1**		1			675	1800	120	86.00	38	167	6.19	0.60	0.00	0.11
	2		1			737	1800	120	84.00	41	144	6.28	0.69	0.00	0.14

Network Results

	Distance travelled (PCU-km/hr)	**Time spent (PCU-hr/hr)**	**Mean journey speed (kph)**	**Uniform delay (PCU-hr/hr)**	**Random plus oversat delay (PCU-hr/hr)**	**Weighted cost of delay (£ per hr)**	**Weighted cost of stops (£ per hr)**	**Excess queue penalty (£ per hr)**	**Performance Index (£ per hr)**
Normal traffic	857.03	74.38	11.52	24.07	21.74	650.50	42.62	0.00	693.12
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	877.43	111.30	7.88	56.98	21.74	1117.93	42.62	0.00	1160.55

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 4 - 2028 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 4.1
Report generation date: 29/04/2022 14:48:05

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber
			✓		✓		✓	✓					

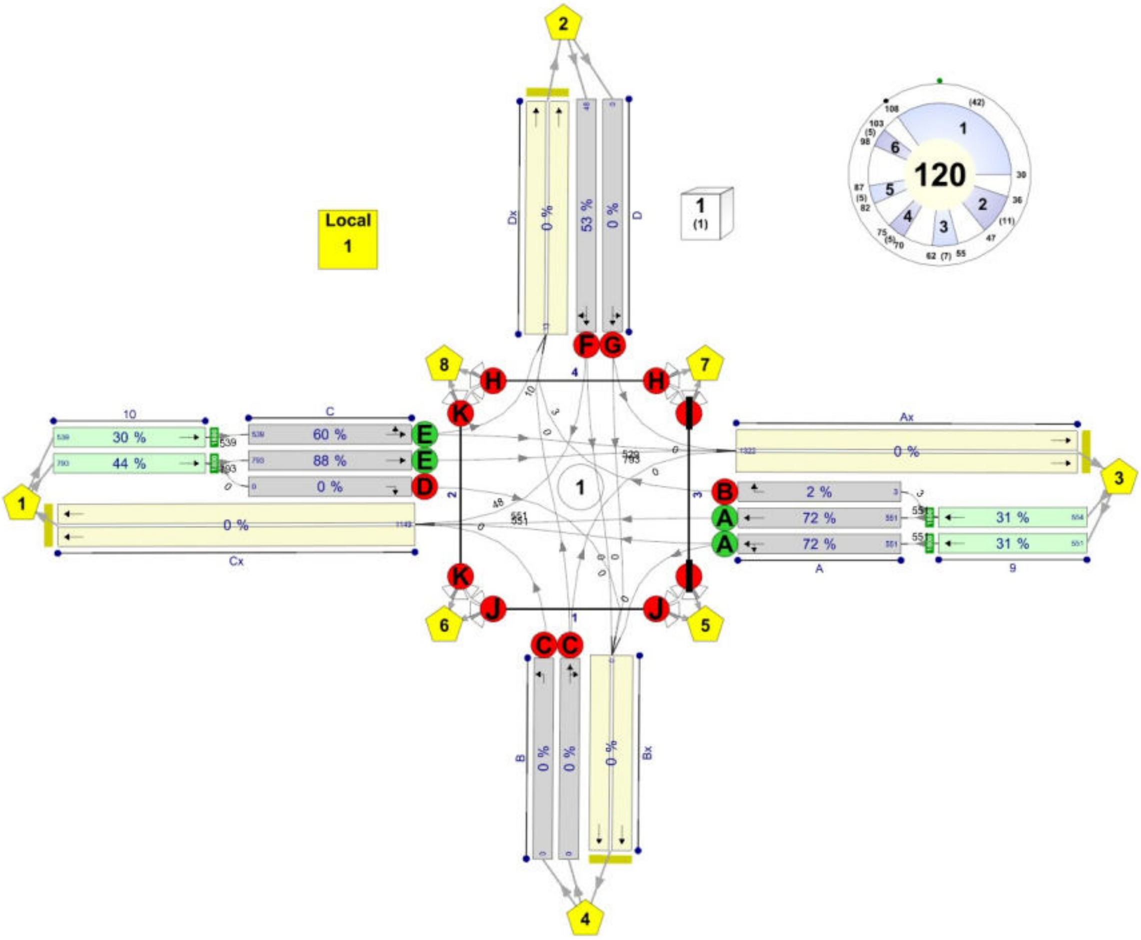
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



(untitled)
Diagram produced using TRANSYT 15.5.2.7994

A1 - Junction 4
D1 - 2028 "with development", PM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	29/04/2022 14:47:56	29/04/2022 14:47:57	17:00	120	801.74	54.55	88.11	C/2	0	0	C/2	10/2	C/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
Junction 4		D1	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2028 "with development", PM	(untitled)			17:00	

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	193.26						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.24						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.73						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	154.63						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			1800
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	551	551
	2	551	551
	3	3	3
Ax	1	1322	1322
B	1	0	0
	2	0	0
Bx	1	0	0
C	1	539	539
	2	793	793
	3	0	0
Cx	1	1149	1149
D	1	0	0
	2	48	48
Dx	1	13	13
9	1	551	551
	2	554	554
10	1	539	539
	2	793	793

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	**1**	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	D/1	Ax/1	23.19	30.00	✓	Nearside	36.46
Bx	**1**	**1**	D/1	Bx/1	17.79	30.00	✓	Straight	Straight Movement
C	**1**	**1**	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	**1**	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	**1**	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	D/2	Cx/1	23.85	30.00	✓	Offside	52.80
Dx	**1**	**1**	A/3	Dx/1	18.56	30.00	✓	Offside	47.95
Ax	**1**	**2**	C/2	Ax/1	23.19	30.00	✓	Straight	Straight Movement
Bx	**1**	**2**	A/1	Bx/1	17.79	30.00	✓	Nearside	34.47
Cx	**1**	**2**	A/2	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	18.56	30.00	✓	Nearside	30.96
Ax	**1**	**3**	C/1	Ax/1	23.19	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	C/3	Bx/1	17.79	30.00	✓	Offside	51.34
Cx	**1**	**3**	A/1	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	**1**	**3**	B/2	Dx/1	18.56	30.00	✓	Straight	Straight Movement
Ax	**1**	**4**	B/2	Ax/1	23.19	30.00	✓	Offside	50.69
Bx	**1**	**4**	D/2	Bx/1	17.79	30.00	✓	Straight	Straight Movement
Cx	**1**	**4**	B/1	Cx/1	23.85	30.00	✓	Nearside	39.46

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	10	1322	0	0	0	0	0
	2	48	0	0	0	0	0	0	0
	3	1101	3	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	2	3	4	5	6	7	8
From	1	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	0
	10		2	3	D/1, Ax/1	Normal	0
	11		3	2	9/2, A/3, Dx/1	Normal	3
	12		3	1	9/2, A/2, Cx/1	Normal	551
	13		3	1	9/1, A/1, Cx/1	Normal	551
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Percentage	793
	20		1	4	10/2, C/3, Bx/1	Normal	0
	21		1	3	10/1, C/1, Ax/1	Percentage	529
	43		4	1	B/1, Cx/1	Normal	0
	44		1	2	10/1, C/1, Dx/1	Normal	10
	45		2	1	D/2, Cx/1	Normal	48
	46		2	4	D/2, Bx/1	Normal	0
	47		4	2	B/2, Dx/1	Normal	0
	48		4	3	B/2, Ax/1	Normal	0

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**(ALL)**	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	**1**	E, A	1
	2	E, D	1
	3	A, B	1
	4	F, G	1
	5	C	1
	6	H, I, J, K	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6	30, 47, 62, 75, 87, 103

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	8	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	9	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	9	8	10
	2	8	0	8	9	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	8	8	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	108	30	42	1	5
	2	✓	2	E,D	36	47	11	1	5
	3	✓	3	A,B	55	62	7	1	5
	4	✓	4	F,G	70	75	5	1	5
	5	✓	5	C	82	87	5	1	5
	6	✓	6	H,I,J,K	98	103	5	1	5

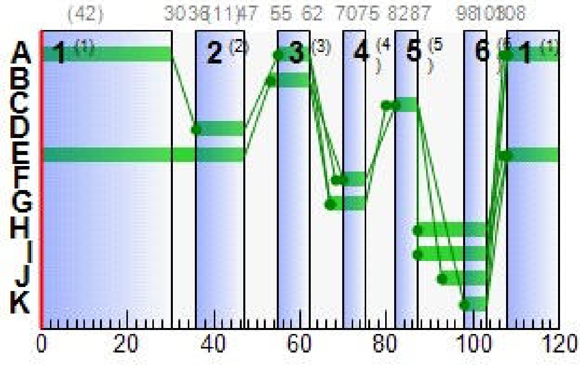
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	55	62	7
		2	✓	108	30	42
	B	1	✓	53	62	9
	C	1	✓	82	87	5
	D	1	✓	36	47	11
	E	1	✓	108	47	59
	F	1	✓	70	75	5
	G	1	✓	67	75	8
	H	1	✓	87	103	16
	I	1	✓	87	103	16
	J	1	✓	93	103	10
	K	1	✓	98	103	5

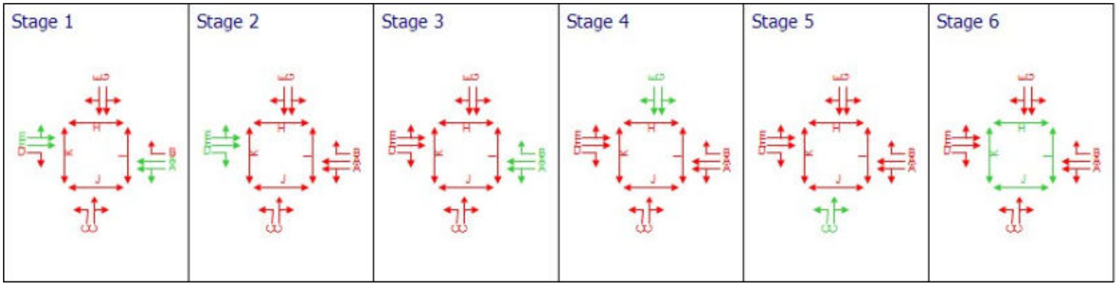
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	1	1	1	A	55	62	7	108	30	42
A	2	1	1	A	55	62	7	108	30	42
A	3	1	1	B	53	62	9			
B	1	1	1	C	82	87	5			
B	2	1	1	C	82	87	5			
C	1	1	1	E	108	47	59			
C	2	1	1	E	108	47	59			
C	3	1	1	D	36	47	11			
D	1	1	1	G	67	75	8			
D	2	1	1	F	70	75	5			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	1	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	A	551 <	1800	49	0.00	72	25	32.14	24.76	85.79	12.07 +
	2		1	1	A	551 <	1800	49	0.00	72	25	32.14	24.76	85.79	12.07 +
	3		1	1	B	3	1800	9	9.00	2	4400	58.89	51.12	90.68	0.00
Ax	**1**	(untitled)				1322	Unrestricted	120	38.00	0	Unrestricted	23.19	0.00	0.00	0.00
B	**1**	(untitled)	1	1	C	0	1800	5	6.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	C	0	1800	5	6.00	0	Unrestricted	0.00	0.00	0.00	0.00
Bx	**1**	(untitled)				0	Unrestricted	120	120.00	0	Unrestricted	0.00	0.00	0.00	0.00
C	**1**	(untitled)	1	1	E	539 <	1800	59	0.00	60	50	31.98	24.38	71.86	13.17 +
	2		1	1	E	793 <	1800	59	0.00	88	2	48.22	40.62	98.04	26.61 +
	3		1	1	D	0	1800	11	12.00	0	Unrestricted	0.00	0.00	0.00	0.00
Cx	**1**	(untitled)				1150	Unrestricted	120	17.00	0	Unrestricted	23.85	0.00	0.00	0.00
D	**1**	(untitled)	1	1	G	0	1800	8	9.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2		1	1	F	48	1800	5	2.00	53	69	86.22	77.64	113.95	1.85
Dx	**1**	(untitled)				13	Unrestricted	120	120.00	0	Unrestricted	18.56	0.00	0.00	0.00
9	**1**		1			551	1800	120	9.00	31	194	5.90	0.44	0.00	0.07
	2		1			554	1800	120	9.00	31	192	5.90	0.44	0.00	0.07
10	**1**		1			539	1800	120	15.00	30	201	6.01	0.43	0.00	0.06
	2		1			793	1800	120	71.00	44	104	6.37	0.79	0.00	0.17

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	754.03	46.76	16.12	15.65	5.98	307.13	27.18	0.00	334.31
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	774.43	83.68	9.25	48.57	5.98	774.57	27.18	0.00	801.74

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 4 - 2040 AM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 4.1
Report generation date: 29/04/2022 14:56:14

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber
			✓		✓		✓	✓					

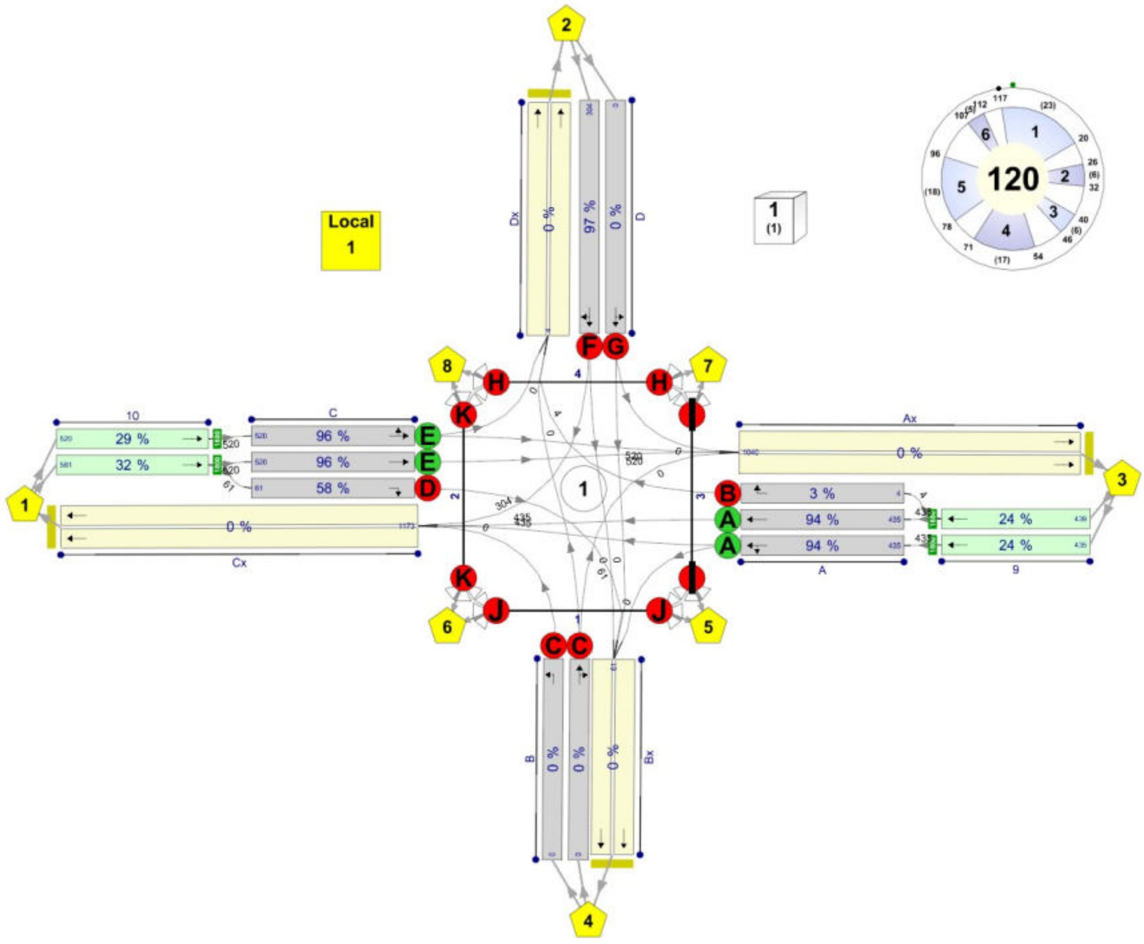
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



(untitled)
Diagram produced using TRANSYT 15.5.2.7994

A1 - Junction 4
D2 - 2040 "with development", AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	29/04/2022 14:56:07	29/04/2022 14:56:08	08:00	120	1281.30	87.39	96.51	D/2	0	0	D/2	10/2	D/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
Junction 4		D2	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2040 "with development", AM	(untitled)			08:00	

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	192.83						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.83						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	199.09						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Directly entered	2100	✓		Normal	
Dx	1	(untitled)		✓	154.64						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	435	435
	2	435	435
	3	4	4
Ax	1	1040	1040
B	1	0	0
	2	0	0
Bx	1	61	61
C	1	520	520
	2	520	520
	3	61	61
Cx	1	1173	1173
D	1	0	0
	2	304	304
Dx	1	4	4
9	1	435	435
	2	439	439
10	1	520	520
	2	581	581

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	**1**	**1**	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	**1**	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	**1**	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	**1**	**1**	D/1	Ax/1	23.14	30.00	✓	Nearside	36.46
Bx	**1**	**1**	D/1	Bx/1	17.86	30.00	✓	Straight	Straight Movement
C	**1**	**1**	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	**1**	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	**1**	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	**1**	**1**	D/2	Cx/1	23.89	30.00	✓	Offside	52.80
Dx	**1**	**1**	A/3	Dx/1	18.56	30.00	✓	Offside	47.95
Ax	**1**	**2**	C/2	Ax/1	23.14	30.00	✓	Straight	Straight Movement
Bx	**1**	**2**	A/1	Bx/1	17.86	30.00	✓	Nearside	35.16
Cx	**1**	**2**	A/2	Cx/1	23.89	30.00	✓	Straight	Straight Movement
Dx	**1**	**2**	C/1	Dx/1	18.56	30.00	✓	Nearside	30.95
Ax	**1**	**3**	C/1	Ax/1	23.14	30.00	✓	Straight	Straight Movement
Bx	**1**	**3**	C/3	Bx/1	17.86	30.00	✓	Offside	52.04
Cx	**1**	**3**	A/1	Cx/1	23.89	30.00	✓	Straight	Straight Movement
Dx	**1**	**3**	B/2	Dx/1	18.56	30.00	✓	Straight	Straight Movement
Ax	**1**	**4**	B/2	Ax/1	23.14	30.00	✓	Offside	48.69
Bx	**1**	**4**	D/2	Bx/1	17.86	30.00	✓	Straight	Straight Movement
Cx	**1**	**4**	B/1	Cx/1	23.89	30.00	✓	Nearside	40.34

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	**(ALL)**	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	1040	61	0	0	0	0
	2	304	0	0	0	0	0	0	0
	3	869	4	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	0
	10		2	3	D/1, Ax/1	Normal	0
	11		3	2	9/2, A/3, Dx/1	Normal	4
	12		3	1	9/2, A/2, Cx/1	Normal	435
	13		3	1	9/1, A/1, Cx/1	Normal	435
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Normal	520
	20		1	4	10/2, C/3, Bx/1	Normal	61
	21		1	3	10/1, C/1, Ax/1	Normal	520
	24		4	2	B/2, Dx/1	Normal	0
	43		4	1	B/1, Cx/1	Normal	0
	44		1	2	10/1, C/1, Dx/1	Normal	0
	45		2	1	D/2, Cx/1	Normal	304
	46		4	3	B/2, Ax/1	Normal	0
	47		2	4	D/2, Bx/1	Normal	0

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	**A**	(untitled)	5	300	0	0	Unknown
	B	(untitled)	5	300	0	0	Unknown
	C	(untitled)	18	300	0	0	Unknown
	D	(untitled)	5	300	0	0	Unknown
	E	(untitled)	5	300	0	0	Unknown
	F	(untitled)	9	300	0	0	Unknown
	G	(untitled)	9	300	0	0	Unknown
	H	(untitled)	5	300	0	0	Unknown
	I	(untitled)	5	300	0	0	Unknown
	J	(untitled)	5	300	0	0	Unknown
	K	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	**1**	E, A	1
	2	E, D	1
	3	A, B	1
	4	F, G	1
	5	C	1
	6	H, I, J, K	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6	20, 32, 46, 71, 96, 112

Intergreen Matrix for Controller Stream 1

		To										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
From	**A**			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	9	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	10	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	**2**	**3**	**4**	**5**	**6**
From	**1**						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	10	8	10
	2	8	0	8	10	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	9	9	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	117	20	23	1	5
	2	✓	2	E,D	26	32	6	1	5
	3	✓	3	A,B	40	46	6	1	5
	4	✓	4	F,G	54	71	17	1	9
	5	✓	5	C	78	96	18	1	18
	6	✓	6	H,I,J,K	107	112	5	1	5

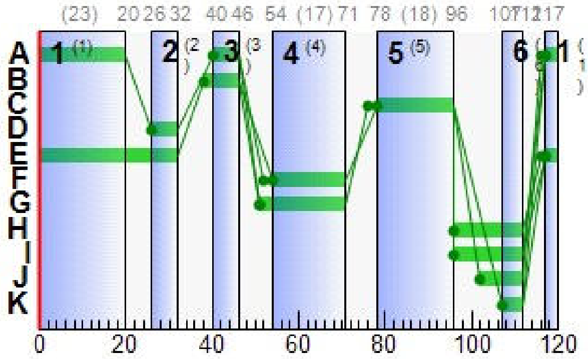
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	40	46	6
		2	✓	117	20	23
	B	**1**	✓	38	46	8
	C	**1**	✓	78	96	18
	D	**1**	✓	26	32	6
	E	**1**	✓	117	32	35
	F	**1**	✓	54	71	17
	G	**1**	✓	51	71	20
	H	**1**	✓	96	112	16
	I	**1**	✓	96	112	16
	J	**1**	✓	102	112	10
	K	**1**	✓	107	112	5

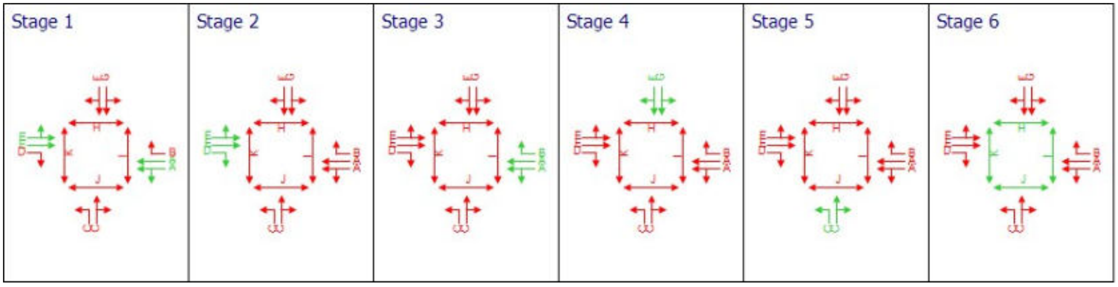
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	**1**	1	1	A	40	46	6	117	20	23
A	**2**	1	1	A	40	46	6	117	20	23
A	**3**	1	1	B	38	46	8			
B	**1**	1	1	C	78	96	18			
B	**2**	1	1	C	78	96	18			
C	**1**	1	1	E	117	32	35			
C	**2**	1	1	E	117	32	35			
C	**3**	1	1	D	26	32	6			
D	**1**	1	1	G	51	71	20			
D	**2**	1	1	F	54	71	17			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)
A	1	(untitled)	1	1	A	435 <	1800	29	0.00	94	7	76.75	69.36	151.34	16.00 +
	2		1	1	A	435 <	1800	29	0.00	94	7	76.75	69.36	151.34	16.00 +
	3		1	1	B	4	1800	8	8.00	3	3275	59.98	52.21	91.85	0.12
Ax	1	(untitled)				1040	Unrestricted	120	57.00	0	Unrestricted	23.14	0.00	0.00	0.00
B	1	(untitled)	1	1	C	0	1800	18	19.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	C	0	1800	18	19.00	0	Unrestricted	0.00	0.00	0.00	0.00
Bx	1	(untitled)				61	Unrestricted	120	101.00	0	Unrestricted	17.86	0.00	0.00	0.00
C	1	(untitled)	1	1	E	520 <	1800	35	0.00	96	4	97.27	89.68	132.90	24.03 +
	2		1	1	E	520 <	1800	35	0.00	96	4	97.27	89.68	132.90	24.03 +
	3		1	1	D	61	1800	6	0.00	58	72	85.73	77.84	113.78	2.35
Cx	1	(untitled)				1174	Unrestricted	120	21.00	0	Unrestricted	23.89	0.00	0.00	0.00
D	1	(untitled)	1	1	G	0	1800	20	21.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2		1	1	F	304 <	2100	17	0.00	97	4	129.46	120.89	148.59	15.98 +
Dx	1	(untitled)				4	Unrestricted	120	118.00	0	Unrestricted	18.56	0.00	0.00	0.00
9	1		1			435	1800	120	44.00	24	314	5.77	0.32	0.00	0.04
	2		1			439	1800	120	44.00	24	310	5.78	0.32	0.00	0.04
10	1		1			520	1800	120	91.00	29	246	5.99	0.41	0.00	0.06
	2		1			581	1800	120	91.00	32	210	6.06	0.48	0.00	0.08

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (PCU-hr/hr)	Random plus oversat delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	680.30	77.14	8.82	24.20	30.27	773.44	40.42	0.00	813.86
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	700.70	114.06	6.14	57.12	30.27	1240.88	40.42	0.00	1281.30

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: Junction 4 - 2040 PM.t16
Path: M:\Projects\19\19-114 - Belcamp SHD\Design\Traffic\Junction Analysis\MODELLING APRIL 2022\Junction 4.1
Report generation date: 29/04/2022 15:00:07

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	06/12/2011
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\f.silva
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber
			✓		✓		✓	✓					

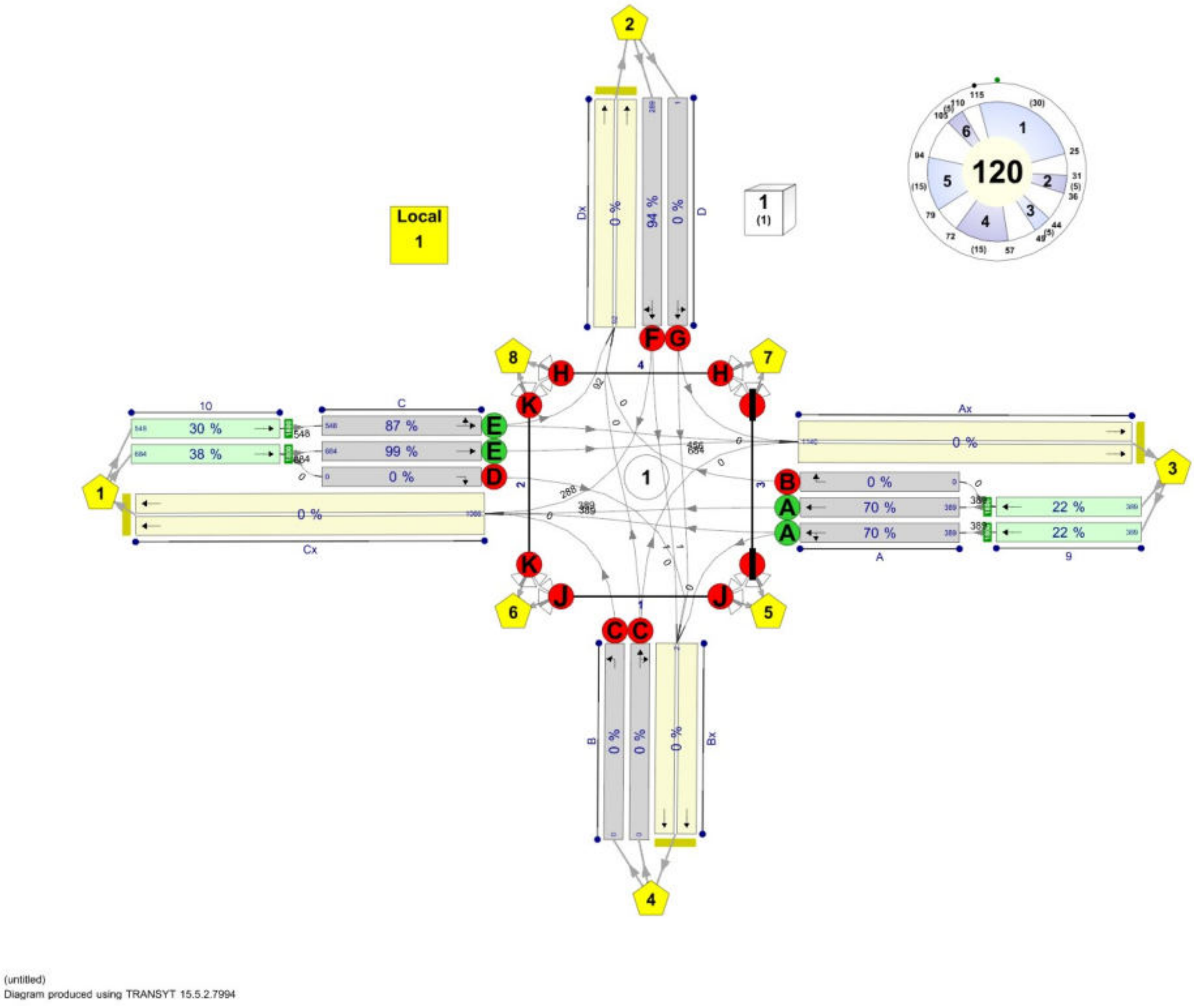
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



(untitled)
Diagram produced using TRANSYT 15.5.2.7994

A1 - Junction 4
D2 - 2040 "with development", PM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	29/04/2022 15:00:00	29/04/2022 15:00:00	17:00	120	1094.07	74.69	98.50	C/2	0	0	C/2	10/2	C/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
Junction 4		D2	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2040 "with development", PM	(untitled)			17:00	

Traffic Nodes

Traffic Nodes

Traffic node	Name	Description
1	(untitled)	

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	(untitled)		1
Ax	(untitled)		
B	(untitled)		1
Bx	(untitled)		
C	(untitled)		1
Cx	(untitled)		
D	(untitled)		1
Dx	(untitled)		
9			1
10			1

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
A	1	(untitled)		✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	2			✓	61.56	✓	Sum of lanes	1800	✓		Normal	
	3			✓	64.79	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	192.95						Normal	
B	1	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	61.63	✓	Sum of lanes	1800	✓		Normal	
Bx	1	(untitled)		✓	148.63						Normal	
C	1	(untitled)		✓	63.28	✓	Sum of lanes	1800	✓		Normal	
	2			✓	63.28	✓	Directly entered	1984	✓		Normal	
	3			✓	65.68	✓	Sum of lanes	1800	✓		Normal	
Cx	1	(untitled)		✓	198.79						Normal	
D	1	(untitled)		✓	71.44	✓	Sum of lanes	1800	✓		Normal	
	2			✓	71.44	✓	Directly entered	2300	✓		Normal	
Dx	1	(untitled)		✓	154.72						Normal	
9	1			✓	45.45	✓	Sum of lanes	1800			Normal	
	2			✓	45.45	✓	Sum of lanes	1800			Normal	
10	1			✓	46.55	✓	Sum of lanes	1800			Normal	
	2			✓	46.55	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Saturation flow (PCU/hr)
A	1	1	(untitled)			1800
	2	1	(untitled)			1800
	3	1	(untitled)			1800
Ax	1	1	(untitled)			
		2	(untitled)			
B	1	1	(untitled)			1800
	2	1	(untitled)			1800
Bx	1	1	(untitled)			
		2	(untitled)			
C	1	1	(untitled)			1800
	2	1	(untitled)			
	3	1	(untitled)			1800
Cx	1	1	(untitled)			
		2	(untitled)			
D	1	1	(untitled)			1800
	2	1	(untitled)			
Dx	1	1	(untitled)			
		2	(untitled)			
9	1	1	(untitled)			1800
	2	1	(untitled)			1800
10	1	1	(untitled)			1800
	2	1	(untitled)			1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
(ALL)	(ALL)	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
A	1	389	389
	2	389	389
	3	0	0
Ax	1	1140	1140
B	1	0	0
	2	0	0
Bx	1	2	2
C	1	548	548
	2	684	684
	3	0	0
Cx	1	1066	1066
D	1	1	1
	2	289	289
Dx	1	92	92
9	1	389	389
	2	389	389
10	1	548	548
	2	684	684

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
A	1	1	A	
	2	1	A	
	3	1	B	
B	1	1	C	
	2	1	C	
C	1	1	E	
	2	1	E	
	3	1	D	
D	1	1	G	
	2	1	F	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
B	1	7.40	30.00
	2	7.40	30.00
D	1	8.57	30.00
	2	8.57	30.00
9	1	5.45	30.00
	2	5.45	30.00
10	1	5.59	30.00
	2	5.59	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
A	1	1	9/1	A/1	7.39	30.00	✓	Straight	Straight Movement
	2	1	9/2	A/2	7.39	30.00	✓	Straight	Straight Movement
	3	1	9/2	A/3	7.78	30.00	✓	Straight	Straight Movement
Ax	1	1	D/1	Ax/1	23.15	30.00	✓	Nearside	36.46
Bx	1	1	D/1	Bx/1	17.84	30.00	✓	Straight	Straight Movement
C	1	1	10/1	C/1	7.59	30.00	✓	Straight	Straight Movement
	2	1	10/2	C/2	7.59	30.00	✓	Straight	Straight Movement
	3	1	10/2	C/3	7.88	30.00	✓	Straight	Straight Movement
Cx	1	1	D/2	Cx/1	23.85	30.00	✓	Offside	52.80
Dx	1	1	A/3	Dx/1	18.57	30.00	✓	Offside	48.16
Ax	1	2	C/2	Ax/1	23.15	30.00	✓	Straight	Straight Movement
Bx	1	2	A/1	Bx/1	17.84	30.00	✓	Nearside	34.92
Cx	1	2	A/2	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	1	2	C/1	Dx/1	18.57	30.00	✓	Nearside	31.17
Ax	1	3	C/1	Ax/1	23.15	30.00	✓	Straight	Straight Movement
Bx	1	3	C/3	Bx/1	17.84	30.00	✓	Offside	51.79
Cx	1	3	A/1	Cx/1	23.85	30.00	✓	Straight	Straight Movement
Dx	1	3	B/2	Dx/1	18.57	30.00	✓	Straight	Straight Movement
Ax	1	4	B/2	Ax/1	23.15	30.00	✓	Offside	49.38
Bx	1	4	D/2	Bx/1	17.84	30.00	✓	Straight	Straight Movement
Cx	1	4	B/1	Cx/1	23.85	30.00	✓	Nearside	40.34

Pedestrian Crossings

Pedestrian Crossings

Crossing	Name	Description	Traffic node	Allow walk on red	Crossing type	Length (m)	Cruise time (seconds)	Cruise speed (kph)
1	(untitled)		1		Farside	7.00	4.67	5.40
2	(untitled)		1		Farside	8.00	5.33	5.40
3	(untitled)		1		Farside	8.00	5.33	5.40
4	(untitled)		1		Farside	7.00	4.67	5.40

Pedestrian Crossings - Signals

Crossing	Controller stream	Phase	Second phase enabled
1	1	J	
2	1	K	
3	1	I	
4	1	H	

Pedestrian Crossings - Sides

Crossing	Side	Saturation flow (Ped/hr)
(ALL)	(ALL)	11000

Pedestrian Crossings - Modelling

Crossing	Side	Delay weighting (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (Ped)	Has queue limit	Has degree of saturation limit
(ALL)	**(ALL)**	100	100		0.00		

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation	✓		✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	92	1140	0	0	0	0	0
	2	288	0	0	2	0	0	0	0
	3	778	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows (PCU/hr)

		To							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
From	**1**	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	300	300	0
	6	0	0	0	0	300	0	0	300
	7	0	0	0	0	300	0	0	300
	8	0	0	0	0	0	300	300	0

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	10/1, 10/2	Cx/1	#0000FF
	2	(untitled)	D/1, D/2	Dx/1	#FF0000
	3	(untitled)	9/1, 9/2	Ax/1	#00FF00
	4	(untitled)	B/1, B/2	Bx/1	#FFFF00
	5	(untitled)	3:2E, 1:1E	3:2X, 1:1X	#FF00FF
	6	(untitled)	2:1E, 1:2E	2:1X, 1:2X	#008000
	7	(untitled)	4:2E, 3:1E	4:2X, 3:1X	#FFA500
	8	(untitled)	4:1E, 2:2E	4:1X, 2:2X	#00FFFF

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	**9**		2	4	D/1, Bx/1	Normal	1
	10		2	3	D/1, Ax/1	Normal	0
	11		3	2	9/2, A/3, Dx/1	Normal	0
	12		3	1	9/2, A/2, Cx/1	Normal	389
	13		3	1	9/1, A/1, Cx/1	Normal	389
	14		3	4	9/1, A/1, Bx/1	Normal	0
	19		1	3	10/2, C/2, Ax/1	Percentage	684
	20		1	4	10/2, C/3, Bx/1	Normal	0
	21		1	3	10/1, C/1, Ax/1	Percentage	456
	24		4	2	B/2, Dx/1	Normal	0
	43		4	1	B/1, Cx/1	Normal	0
	44		1	2	10/1, C/1, Dx/1	Normal	92
	45		2	1	D/2, Cx/1	Normal	288
	46		4	3	B/2, Ax/1	Normal	0
	47		2	4	D/2, Bx/1	Normal	1

Pedestrian Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Pedestrian calculated flow (Ped/hr)
1	**17**		8	7	4:1E, 4:2X	Normal	300
	18		8	6	2:2E, 2:1X	Normal	300
	22		5	7	3:2E, 3:1X	Normal	300
	23		5	6	1:1E, 1:2X	Normal	300
	34		6	8	2:1E, 2:2X	Normal	300
	35		6	5	1:2E, 1:1X	Normal	300
	41		7	8	4:2E, 4:1X	Normal	300
	42		7	5	3:1E, 3:2X	Normal	300

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Relative

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	5	300	0	0	Unknown
	B	(untitled)	5	300	0	0	Unknown
	C	(untitled)	15	300	0	0	Unknown
	D	(untitled)	5	300	0	0	Unknown
	E	(untitled)	5	300	0	0	Unknown
	F	(untitled)	5	300	0	0	Unknown
	G	(untitled)	5	300	0	0	Unknown
	H	(untitled)	5	300	0	0	Unknown
	I	(untitled)	5	300	0	0	Unknown
	J	(untitled)	5	300	0	0	Unknown
	K	(untitled)	5	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	E, A	1
	2	E, D	1
	3	A, B	1
	4	F, G	1
	5	C	1
	6	H, I, J, K	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6	25, 36, 49, 72, 94, 110

Intergreen Matrix for Controller Stream 1

		To										
		A	B	C	D	E	F	G	H	I	J	K
From	A			8	6		6	5		6	10	0
	B			5		7	8	5	12	6		
	C	5	8		5	8	7	9	0	0	6	11
	D	8		7			5	5			0	6
	E		6	5			6	9	10	0		6
	F	5	5	7	7	5			6			0
	G	9	5	5	6	5			6	10	0	
	H		4	4		4	4	4				
	I	5	5	5		5		5				
	J	4		4	4			4				
	K	5		5	5	5	5					

Banned Stage transitions for Controller Stream 1

		To					
		1	2	3	4	5	6
From	1						
	2						
	3						
	4						
	5						
	6						

Interstage Matrix for Controller Stream 1

	To						
		1	**2**	**3**	**4**	**5**	**6**
From	**1**	0	6	6	9	8	10
	2	8	0	8	9	7	10
	3	7	7	0	8	8	12
	4	9	7	9	0	7	10
	5	8	8	8	9	0	11
	6	5	5	5	5	5	0

Resultant Stages

Controller Stream	Resultant Stage	Is base stage	Library Stage ID	Phases in this stage	Stage start (s)	Stage end (s)	Stage duration (s)	User stage minimum (s)	Stage minimum (s)
1	**1**	✓	1	E,A	115	25	30	1	5
	2	✓	2	E,D	31	36	5	1	5
	3	✓	3	A,B	44	49	5	1	5
	4	✓	4	F,G	57	72	15	1	5
	5	✓	5	C	79	94	15	1	15
	6	✓	6	H,I,J,K	105	110	5	1	5

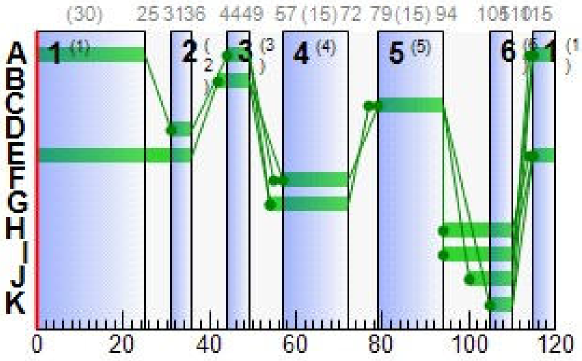
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	**A**	**1**	✓	44	49	5
		2	✓	115	25	30
	B	**1**	✓	42	49	7
	C	**1**	✓	79	94	15
	D	**1**	✓	31	36	5
	E	**1**	✓	115	36	41
	F	**1**	✓	57	72	15
	G	**1**	✓	54	72	18
	H	**1**	✓	94	110	16
	I	**1**	✓	94	110	16
	J	**1**	✓	100	110	10
	K	**1**	✓	105	110	5

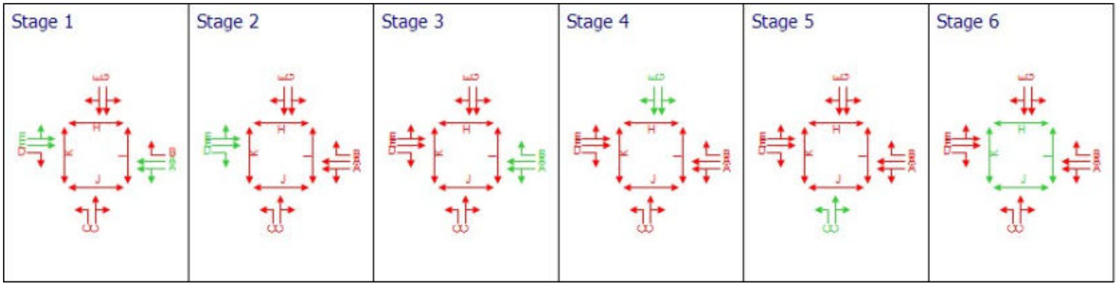
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
A	**1**	1	1	A	44	49	5	115	25	30
A	**2**	1	1	A	44	49	5	115	25	30
A	**3**	1	1	B	42	49	7			
B	**1**	1	1	C	79	94	15			
B	**2**	1	1	C	79	94	15			
C	**1**	1	1	E	115	36	41			
C	**2**	1	1	E	115	36	41			
C	**3**	1	1	D	31	36	5			
D	**1**	1	1	G	54	72	18			
D	**2**	1	1	F	57	72	15			

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
17:00-18:00	**1**	0.00	0.00	0.00	0.00

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**
A	**1**	(untitled)	1	1	A	389	1800	35	0.00	70	43	39.03	31.65	96.46	9.67
	2		1	1	A	389	1800	35	0.00	70	43	39.03	31.65	96.46	9.67
	3		1	1	B	0	1800	7	8.00	0	Unrestricted	0.00	0.00	0.00	0.00
Ax	**1**	(untitled)				1140	Unrestricted	120	52.00	0	Unrestricted	23.15	0.00	0.00	0.00
B	**1**	(untitled)	1	1	C	0	1800	15	16.00	0	Unrestricted	0.00	0.00	0.00	0.00
	2	(untitled)	1	1	C	0	1800	15	16.00	0	Unrestricted	0.00	0.00	0.00	0.00
Bx	**1**	(untitled)				2	Unrestricted	120	120.00	0	Unrestricted	17.84	0.00	0.00	0.00
C	**1**	(untitled)	1	1	E	548 <	1800	41	0.00	87	15	61.62	54.02	105.52	19.72 +
	2		1	1	E	684 <	1984	41	0.00	99	2	100.26	92.66	137.26	32.67 +
	3		1	1	D	0	1800	5	6.00	0	Unrestricted	0.00	0.00	0.00	0.00
Cx	**1**	(untitled)				1066	Unrestricted	120	18.00	0	Unrestricted	23.85	0.00	0.00	0.00
D	**1**	(untitled)	1	1	G	1	1800	18	18.00	0	28400	51.52	42.95	83.18	0.00
	2		1	1	F	289 <	2300	15	0.00	94	6	118.75	110.17	140.67	14.18 +
Dx	**1**	(untitled)				92	Unrestricted	120	74.00	0	Unrestricted	18.57	0.00	0.00	0.00
9	**1**		1			389	1800	120	0.00	22	363	5.73	0.28	0.00	0.03
	2		1			389	1800	120	0.00	22	363	5.73	0.28	0.00	0.03
10	**1**		1			548	1800	120	58.00	30	228	6.02	0.44	0.00	0.07
	2		1			684	1800	120	115.00	38	163	6.20	0.61	0.00	0.12

Network Results

	Distance travelled (PCU-km/hr)	**Time spent (PCU-hr/hr)**	**Mean journey speed (kph)**	**Uniform delay (PCU-hr/hr)**	**Random plus oversat delay (PCU-hr/hr)**	**Weighted cost of delay (£ per hr)**	**Weighted cost of stops (£ per hr)**	**Excess queue penalty (£ per hr)**	**Performance Index (£ per hr)**
Normal traffic	685.68	64.62	10.61	22.27	19.49	593.09	33.54	0.00	626.63
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians	20.40	36.92	0.55	32.92	0.00	467.44	0.00	0.00	467.44
TOTAL	706.08	101.54	6.95	55.19	19.49	1060.53	33.54	0.00	1094.07

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

APPENDIX 13.1: NATIONAL MONUMENTS LEGISLATION 1930-2004

All archaeological sites have the full protection of the national monuments legislation (Principal Act 1930; Amendments 1954, 1987, 1994 and 2004).

In the 1987 Amendment of Section 2 of the Principal Act (1930), the definition of a national monument is specified as:

any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections,

any artificial cave, stone or natural product, whether forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position,

any, or any part of any, prehistoric or ancient

(i) tomb, grave or burial deposit, or

(ii) ritual, industrial or habitation site,

and

any place comprising the remains or traces of any such building, structure or erection, any cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site...

Under Section 14 of the Principal Act (1930):

It shall be unlawful...

to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned (a licence issued by the Office of Public Works National Monuments Branch),

or

to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance...

Under Amendment to Section 23 of the Principal Act (1930), a person who finds an archaeological object shall, within four days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum...

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all of the sites and ‘places’ recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to ‘registered’ sites [Section 8(1), National Monuments Amendment Act 1954] as follows:

The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.

The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.

In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.

The National Monuments Amendment Act 2004

The National Monuments Amendment Act enacted in 2004 provides clarification in relation to the division of responsibilities between the Minister of Environment, Heritage and Local Government, Finance and Arts, Sports and Tourism together with the Commissioners of Public Works. The Minister of Environment, Heritage and Local Government will issue directions relating to archaeological works and will be advised by the National Monuments Section and the National Museum of Ireland. The Act gives discretion to the Minister of Environment, Heritage and Local Government to grant consent or issue directions in relation to road developments (Section 49 and 51) approved by An Bord Pleanála and/or in relation to the discovery of National Monuments

14A. (1) The consent of the Minister under section 14 of this Act and any further consent or licence under any other provision of the National Monuments Acts 1930 to 2004 shall not be required where the works involved are connected with an approved road development.

(2) Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the minister with the Director of the National Museum of Ireland.

Subsection 14A (4) Where a national monument has been discovered to which subsection (3) of this section relates, then

(a) the road authority carrying out the road development shall report the discovery to the Minister

(b) subject to subsection (7) of this section, and pending any directions by the minister under paragraph (d) of this subsection, no works which would interfere with the monument shall be carried out, except works urgently required to secure its preservation carried out in accordance with such measures as may be specified by the Minister

The Minister will consult with the Director of the National Museum of Ireland for a period not longer than 14 days before issuing further directions in relation to the national monument.

The Minister will not be restricted to archaeological considerations alone, but will also consider the wider public interest.

APPENDIX 13.2: PLANNING AND DEVELOPMENT ACT, 2000

Structures of architectural, cultural, scientific, historical or archaeological interest can also be protected under the Planning and Development Act, 2000.

This act provides for the inclusion of protected structures into the planning authorities’ development plans and sets out statutory regulations regarding works affecting such structures. Under the new legislation, no distinction is made between buildings formerly classified under development plans as List 1 and List 2. Such buildings are now all regarded as ‘protected structures’.

The act defines a ‘protected structure’ as follows:

(a) a structure, or

(b) a specified part of a structure,

which is included in a record of protected structures, and, where that record so indicates, includes any specified feature which is within the attendant grounds of the structure and which would not otherwise be included in this definition.

‘Protection’, in relation to a structure or part of a structure, includes conservation, preservation, and improvement compatible with maintaining the character and interest of the structure or part;

Part IV of the act deals with architectural heritage, and Section 57 deals specifically with works affecting the character of protected structures or proposed protected structures.

…the carrying out of works to a protected structure, or a proposed protected structure, shall be exempted development only if those works would not materially affect the character of—

(a) the structure, or

(b) any element of the structure which contributes to its special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

Section 58, subsection 4 states that:

Any person who, without lawful authority, causes damage to a protected structure or a proposed protected structure shall be guilty of an offence.

APPENDIX 13.3: ARCHAEOLOGICAL TEST-TRENCHING REPORT

Belcamp and Balgriffin, Malahide Rd, Dublin 17

Archaeological test trenching report

Client: Gerard Gannon Properties

Licence No: 21E0787

Archaeologist: Maeve Mc Cormick

Authors: Maeve McCormick

Report Date: 29th November 2021

Our Ref: 2021_67

Archer
Heritage Planning

Belcamp and Balgriffin, Malahide Rd, Dublin 17

SITE NAME	Belcamp and Balgriffin, Malahide Rd, Dublin 17
CLIENT	Gerard Gannon Properties
INVESTIGATION TYPE	Test trenching
LICENCE NO	21E0787
PLANNING REF	SHD, Preplanning
TOWNLAND	Belcamp and Balgriffin
IRISH TRANSVERSE MERCATOR	720204, 741440
RMP NO	DU014-128
RPS NO	N/A
ARCHAEOLOGICAL CONSULTANT	Archer Heritage Planning Ltd.
PERSONNEL	Maeve Mc Cormick
DATE OF ISSUE	29th November 2021
JOB REF.	2021_67

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SUMMARY

This archaeological impact assessment undertaken at Belcamp and Balgriffin, Malahide Rd, Dublin 17 (ITM 720204, 741440, Figure 1) has been prepared by Archer Heritage Planning Ltd for Gerard Gannon Properties. The report presents the results of test excavation which was undertaken under licence 21E0787 to the Department of Housing, Local Government and Heritage (DHLGH) in consultation with the National Museum of Ireland (NMI) on the 22nd to 24th November 2021. The following factors were identified:

- The subject site is large in scale with an area of c. 63 Hectares located due west of the Northern Cross on the Malahide Road.
- There is one SMR site located within the proposed development site, a ring-ditch (DU014-128) that was identified on aerial imagery
- No potential archaeological features were recorded in early maps of the subject site
- No previously unknown features of archaeological potential were noted during analysis of aerial photography
- No archaeological excavations have been undertaken previously within the subject site.
- There are no Protected Structures within the subject site.
- The subject site does not lie within an Architectural Conservation Area.
- A Geophysical survey (21R0190) was undertaken in Sept 2021. Areas of possible pits, enclosures and possible ring ditches were detected throughout the survey area. Of particular note is a potential double ring-ditch on the northern field boundary and a large enclosure containing possible pits.
- RMP DU014-128 was tested by two trenches (1 & 4) nothing of archaeological significance was uncovered. Variations in the subsoil, in particular a curved band of silty-clay, may explain the geophysical anomalies and the crop marks.
- No features of archaeological significance were recorded in the course of test excavation.

RECOMMENDATIONS

It is recommended that RMP DU014-128 is removed from the Record of Monuments and Places.

NOTE: All conclusions and recommendations expressed in this report are subject to the approval of The Department of Housing, Local Government and Heritage (DHLGH) and the relevant local authorities. As the statutory body responsible for the protection of Ireland's archaeological and cultural heritage resource, the DHLGH may issue alternative or additional recommendations.

Revision	Status	Date	Prepared by	Reviewed by	Approved by
1	Final	29/11/2021	MMC (Archer)	AOC (Archer)	CMG

1. INTRODUCTION

This archaeological impact assessment undertaken at Belcamp and Balgriffin, Malahide Rd, Dublin 17 (ITM 720204, 741440, Figure 1) has been prepared by Archer Heritage Planning Ltd for Gerard Gannon Properties. The report presents the results of test excavation which was undertaken under licence 21E0787 to the Department of Housing, Local Government and Heritage (DHLGH) in consultation with the National Museum of Ireland (NMI). The work was carried out between 22nd and 24th of November 2021.

1.1 Proposed Development

The development is a residential Strategic Housing Development comprising apartments and houses and open spaces totalling 2,546 Units (apartments, houses and duplex units). They will be developed in a phased manner (possibly 7 phases).

2. SITE DESCRIPTION

The proposed development site of c. 63 ha is located due west of the Northern Cross on the Malahide Road. The survey area encompasses 15 agricultural fields which are bounded to the south by the R139. The Mayne River divides the area which is centered around the Belcamp Hall, subsequently used as Belcamp College. The proposed development site is in the townlands of Belcamp and Balgriffin in the parish of Balgriffin, and Clonshagh (E.D. Coolock) in the parish of Santry, within the barony of Coolock.

3. METHOD STATEMENT

A total of 50 machine assisted test trenches (circa 1400 linear metres) were excavated by mechanical excavator under archaeological supervision. The trenches were placed to target the geophysical anomalies identified during a survey carried out under Detection License No. 21R0190.

4. ARCHAEOLOGICAL ASSESSMENT

4.1 Brief archaeological & historical background

Belcamp is described as 'a fancy name' by O'Donovan in the OS Name Book (1837), though its meaning or derivation is otherwise obscure. It is first documented in the Civil Survey of 1654-56 as 'Bell-Campo', which may derive from the Latin words bello and campo meaning 'fair' and 'field or plain' respectively. It is referred to in 1721 as 'Bellcamp… pt. of Clonshagh'. As no Irish version of the townland name is recorded, it may be that the lands of Clonshagh were subdivided some time before the mid-17th century Civil Survey and subsequently renamed Belcamp.

The townland of Clonshagh (modern placename Clonshaugh) is an anglicised version of the Irish cluain seach or cluain samhach, meaning meadowy land or sorrel meadow, with its name first documented in the charter of the Abbey of St Mary in Dublin in c. 1230 (https://www.logainm.ie/en/1436735). The manor of Balgriffin was founded on land granted to a Welsh man by the name of Griffin at the end of the 12th century; it was originally known as Baile Hamund, becoming Baile Grifín – Balgriffin – after the new landowner.

Recorded monuments in the surrounding area suggest that settlement in the general area extends back to at least the Bronze Age with clusters of ring ditches noted in neighbouring townlands.

Lewis does not discuss Belcamp in his Topographical files (1837) however he does refer to Balgriffin. He stated Balgriffin "formerly belonged to the ancient family of the De Burgos, who held the manor in the 14th century, and by whom the castle was erected. It afterwards became the property of the O'Neills and De Bathes, and the castle was for some time the residence of Richard, Duke of Tyrconnel, Lord-Deputy of Ireland under Jas. II.". The castle to which he is referring is Castle DU015-062003 of which there are no extant remains but it is believed to have been replaced by Balgriffin house (DU015-062002) in the 16th Century. The original castle was built in the 12th Century and was reputed to have been located on lands associated with Balgriffin Park. The Civil Survey (1654-6) mentions a stone house at Balgriffin (Simington 1945, 189). This was held by James Bath who owned vast estates in the Drumcondra area. There was a complex of farm buildings on a low-lying site known as Balgriffin Park which may be the site of this stone house. The site is now within open space of a housing development. A test excavation (Licence no. 00E0714) in advance of the Northern Fringe sewer immediately south of the subject site did not identify archaeological remains (archaeology.ie).

4.2 Record of Monuments & Places

The Record of Monuments and Places (RMP) is a statutory inventory of archaeological sites protected under the National Monuments Acts 1930-2004 (Section 12, 1994 Act), compiled and maintained by the Archaeological Survey of Ireland (ASI). The inventory concentrates on pre-1700 AD sites and is based on a previous inventory known as the Sites and Monuments Record (SMR) which does not have legal protection or status (see www.archaeology.ie).

There is one SMR site located within the proposed development site, a ring-ditch (DU014-128) that was identified on aerial imagery. The site is described in the online Historic Environment Viewer as follows:

> 'Located in a large arable field c. 405m SSE of triple-ditched enclosure (DU015-058----). An unnamed W-E running stream, a tributary of the Mayne River, is located c. 75m to the S. The ring-ditch can be seen on Google Earth coverage (24 June 2018) where it is visible as a positive cropmark. The ring-ditch is circular in plan (diam. c. 12.7m) defined by a ditch (Wth c. 1.6m). There is no clear evidence for an entrance gap across the ditch.' (https://maps.archaeology.ie/HistoricEnvironment/)

A recorded ringfort site (DU015-033), which had been identified on aerial imagery, is located at the boundary between the proposed SHD site and the adjoining permitted development at Belcamp Hall.

The Zone of Notification around ringfort site (DU015-033) located to the south of the subject area partially crosses into it. Archaeological testing in 2016 demonstrated that the enclosure (DU015-033) is an early modern landscape design feature (a tree-ring) and not an early medieval ringfort as previously thought. A nearby recorded ring-ditch (DU015-116) was also found to be a tree-ring. Subsequent archaeological monitoring across the site identified nothing of archaeological interest.

An enclosure site (DU015-139), also identified on aerial imagery, is located c. 35m north of the proposed SHD site in Burgage townland. The site is not scheduled for inclusion in the next revision of the RMP.

For further details on all SMRs within a 300m radius of the subject site see Appendix 1

4.3 Cartographic Sources

Analysis of historic mapping can show human impact on landscape over a prolonged period. Large collections of historical maps (pre- and early Ordnance Survey maps as well as estate or private maps) are held at the Glucksman Map Library, Trinity College and other sources (UCD Library, Ordnance Survey Ireland, local libraries and published material). The development of the site and its vicinity recorded through the eighteenth to twentieth century cartography are described in Table 1 below (Figure 2). **No potential archaeological features were recorded within the subject site.**

Map	Date	Description
Down Survey	1656	The map of this area depicts Belcamp (noted as Balcampe) and Balgriffin near Coolock. There isonly one potential structure depicted near Balgriffin.
Taylor and Skinner Map	1777	(Map 1) The subject area is marked only as Belcamp, with a depiction of a country house labelled as owned by Sir E Newenham. This is likely to be Belcamp House (NIAH 11350024) in the east of the townland but could possibly depict either Belcamp Park (RMP DU015-061) or Belcamp House (NIAH 11349005) both to the west of the townland.
Historic 6inch	1837	The subject area is depicted in this map as agricultural land. Many of the field boundaries surviving today are present in this map.
Historic 25inch	1874-76	Little change from earlier maps
Cassini	1911-13	Little change from earlier maps.

Table 1: Cartographic sources relating to the site

4.4 Aerial photography

Aerial photography (or other forms of remote sensing) may reveal certain archaeological features or sites (earthworks, crop marks, soil marks) that for many reasons may not be appreciated at ground level. Online orthostatic photographs of the site were examined (Ordnance Survey Ireland 1995, 2000 & 2005; Google/Bing Maps 2020). No previously unknown features of archaeological potential were noted during analysis of aerial photography (Figure 3). See Table 2 below for details.

Aerial Photograph	Date	Description
OSi (B&W)	1995	The subject area and surrounding landscape remains very similar to that depicted in the Cassini mapping. It is agricultural land. Large residential developments are depicted c.2 km south of the site. The road to the south of the subject site is the original road marked on the maps as 'Belcamp Lane'. However there is evidence of the construction of the modern road along the route.
OSi	2005	Little has changed from the previous photo. The R139 Malahide Road which forms the southern boundary of the subject site has been completed.
OSi	2005	Little has changed from the previous photo. The surrounding lasncape is becoming more developed. The football pitch which forms the western boundary of the site is underconstruction.
OSi	2005-2012	Little change. The surrounding landscape has become more developed.
OSi Digital Globe	2013	Little change. The surrounding landscape has become more developed.
Google map	2020	Little change. The surrounding landscape has become more developed.

Table 2: Aerial Photography

4.5 Previous Archaeological Excavations

The Excavation Bulletin is a database of summary accounts of archaeological excavations in Ireland and Northern Ireland from 1970 onwards. Summaries relating to archaeological excavations undertaken by the National Roads Authority are also available on-line and were consulted for any adjacent sites. Reports on licensed archaeological works are also held by the Archive Unit of the National Monuments Section.

No previous archaeological excavation has taken place within the subject site. Eight excavations took place within a cm500m radius of the subject site. The nearest of these (Licence No 16E0193) took place immediately east of the subject site on the lands of the former 18th Century Demesne of Belcamp Hall which was in use as a school until 2009 (Belcamp College). Two archaeological sites are recorded within the proposed development area boundary, the site of a ringfort (DU015-033) and a ring-ditch (DU015-116). The sites DU015-033 and DU015-116, which were previously thought to be a ringfort and a ring-ditch respectively, have been shown, as a result of test trenching, to be early modern landscape design features, possibly tree-rings. For further details see Appendix 2.

4.6 Architectural Heritage

Local Authorities have a statutory responsibility to safeguard architectural heritage in accordance with Part IV of the Planning and Development Act 2000. Under S.51 (1), a County Council must compile a Record of Protected Structures (RPS), which lists all structures which are of special *architectural*, *historical*, *archaeological*, *artistic*, *cultural*, *scientific*, *social* or *technical* interest. The protection, unless otherwise stated, includes the exterior and interior of the structure, lands lying within its curtilage (boundary), other structures and their interiors within the curtilage, plus all fixtures and fittings which form part of the interior or exterior of any of these structures. Buildings can be added to, or deleted from the RPS at any time, though generally this occurs when the county development plan is being reviewed. The National Inventory of Architectural Heritage (NIAH) was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. It is intended to provide a basis for recommendations of the Minister for Housing, Local Government and Heritage to Local Authorities for the inclusion of particular structures in Records of Protected Structures (RPS).

There are 8 protected structures on Fingal County Council Record of Protected Structures within a c.500m radius of the subject site. The closest RPS is Belcamp Hall (FCC ref No 0463) located only c.100m east & south of the subject site. It comprised the Former Belcamp College school complex (incl 18th century original house, Washington Monument, walled garden, bridge & early 20th century chapel) There are no Protected Structures within the subject area. For further information see Appendix 3

An Architectural Conservation Area (ACA) is a place, area, group of structures or townscapes that is of special interest and that has been afforded statutory protection by the planning authority in accordance with Section 81 of the Planning & Development Act. The subject site does not lie within or near an Architectural Conservation Area.

4.7 Geophysical Survey (Licence No 21R0190)

Geophysical survey was undertaken across the site from 9th August to the 3rd September 2021 by Earthsound Geophysics on behalf of Gerard Gannon Properties (Gimson 2021). A magnetometer survey was undertaken at a sample resolution of 0.5m x 0.25m. Significant potential archaeological remains were further investigated using an electromagnetic instrument at a sampling resolution of 0.5 x 0.25 m. The survey was conducted upon a bedrock geology consisting of limestone and shale, beneath tills. The majority of the survey area was covered in newly harvested crop fields with pasture occurring on the southern edge of the site. Within the southwestern fields large areas of magnetic disturbance were detected, suggestive of soil importation or metallic debris and which may have masked any underlying archaeological remains. The fields to the southeast did however reveal a number of possible arcing ditches, a possible enclosure ditch and a number of possible pits. Within the centre of the survey area a large potential double ditched enclosure was detected alongside a series of possible pits, potential ring-ditches and further possible enclosure ditches. An arcing stone or compact earth feature was also detected which may be archaeological in origin.

The north-eastern fields revealed a number of highly magnetic and stone deposits which could be archaeological or structural in origin. In addition a large oval potential enclosure was detected which is cut by a later townland boundary. This possible enclosure appears to contain internal features and boundaries. Within the north-western portion of the survey area the true extent and composition of recorded monument ring-ditch DU014-128---- was established. This monument appears to comprise of a slightly oval ditch which is punctuated by pits or deposits and a central pit. The monument may have a conjoining ring-ditch on its northern edge. Within the vicinity a number of other possible ring-ditches were detected along with an oval enclosure with internal pits.

Further areas of possible pits, enclosures and possible ring ditches were detected through the north-western portion of the survey area. Of particular note is a potential double ring-ditch on the northern field boundary and a large enclosure containing possible pits. In addition to the possible archaeological remains detected, a large number of relict field boundaries have also been identified (both previously recorded on historic maps and unrecorded). This suggests that the landscape has been intensively cultivated over a long period. When these field boundaries are combined with the evidence of cultivation furrows it becomes apparent that any archaeological remains may have been heavily impacted by agriculture processes.

4.8 Test Trenching

Test excavation was undertaken on the 22nd-24th of November 2021 in dry bright conditions (Plates 1-22). Fifty one machine assisted test trenches (1412 linear metres/2542 sq. m) were excavated across the site under archaeological supervision. The trenches were located in order to target geophysical anomalies. Each trench was inspected for archaeological remains and all trenches were reinstated on completion. The results are listed in Table 3 below.

The entire site had been subject to ploughing in recent times. Topsoil varied in depth measuring on average 0.30-0.40m deep. It comprised orange-brown loose and friable silty clay with occasional small stone inclusions. It overlay subsoil comprising in the main of yellow-orange compact but friable clayey silt. The subsoil was interspersed with variations of small patches or wide bands of black sand and gravel, grey sand, or bright yellow sandy clay. No archaeological features or objects were recorded in any of the excavated trenches.

4.8.1 Constraints

There were no significant constraints on the approved methodology.

4.8.2 Results

Two trenches (Trench 1 & Trench 4) were excavated across the location of RMP DU014-128, a suspected ring ditch, in order to define its nature and extent (Figure 4 & 7). This possible ringditch was initially identified as a crop-mark in aerial photography and subsequently as a geophysical anomaly. Excavation of Trench 1 revealed a curving band of yellow-orange clayey silt, which was tested by hand excavation. This revealed it to be a natural band of subsoil. Excavation of an additional test trench (Trench 4) across the potential ringditch confirmed the presence of further variations in glacially derived subsoil corresponding to the geophysical anomalies and the cropmark (Plates 15 - 18). The feature is interpreted as a non-archaeological variation in natural glacial deposits.

Trenches 26 and 27 in Field C were placed over a potential ringfort/ ring ditch noted in the geophysical survey (Figure 4 & 5). No archaeological material was observed in these trenches. The geophysical anomalies in this area may correspond with further variations in subsoil (Plate 6).

Trench 50 and 51 in Field D displayed large patches of red brick spreads which also contained occasional fragments of table wear pottery across the entirety of both trenches. There was a grassy ridge running across the field suggesting that perhaps there was a relatively modern collapsed wall or dump of debris across this part of the field. These patches correspond with the anomalies on both the gradiometry and resistivity surveys (Plate 21-22).

Four test trenches displayed possible pit-like features. All the possible pits were half sectioned and found to be either a natural subsoil variation (Test Trenches 22, 24 & 47) or a small residual patch of topsoil (Test Trench 40; Plate 19, 20).

All trenches displayed plough marks which corresponded in alignment to the plough lines visible in the field today.

No archaeological features were recorded in the course of the test excavations.

Trench	L x B x D (m)	Orientation	Description
1	24 x 2 x 0.30	NE/SW	Assessing RMP DU014-128, geophysical anomalies correspond to subsoil variations. No archaeology found.
2	24 x 2 x 0.30-0.40	NW/SE	No archaeology found.
3	14 x 2 x 0.30-0.40	NE/SW	No archaeology found.
4	27 x 2 x 0.30-0.40	NW/SE	Assessing RMP DU014-128, geophysical anomalies corresponds to subsoil variations. No archaeology found.
5	15 x 2 x 0.40	E/W	No archaeology found.
6	32 x 2 x 0.30-0.40	NE/SW	No archaeology found.
7	31 x 2 x 0.30-0.40	WNW/ESE	No archaeology found.
8	28 x 2 x 0.30-0.40	WSW-ENE	No archaeology found.
9	24 x 2 x 0.30-0.40	SSW-NNE	No archaeology found.
10	32 x 2 x 0.30-0.40	E/W	No archaeology found.
11	34 x 2 x 0.30-0.40	E/W	No archaeology found.
12	25 x 2 x 0.30-0.40	N/S	No archaeology found.
13	21 x 2 x 0.30-0.40	NW/SE	No archaeology found.
14	25 x 2 x 0.30-0.40	ENE/WSW	No archaeology found.
15	22 x 2 x 0.30-0.40	ENE/WSW	No archaeology found.
16	15 x 2 x 0.30-0.40	N/S	No archaeology found.
17	22 x 2 x 0.30-0.40	NW/SE	No archaeology found.
18	61 x 2 x 0.30-0.40	NW/SE	No archaeology found.
19	24 x 2 x 0.30-0.40	NE/SW	No archaeology found.
20	40 x 2 x 0.30-0.40	WNW/ESE	No archaeology found.
21	16 x 2 x 0.30-0.40	NE/SW	No archaeology found.
22	20 x 2 x 0.30-0.40	NW/SW	Possible pit investigated- found to be natural subsoil variation. No archaeology found.
23	24 x 2 x 0.30-0.40	NE/SW	No archaeology found.
24	30 x 2 x 0.30-0.40	NE/SW	Possible pit investigated- found to be natural subsoil variation. No archaeology found.
25	34 x 2 x 0.30-0.40	NNE/SSW	No archaeology found.
26	19 x 2 x 0.30-0.40	NNW/SSW	No archaeology found.
27	41 x 2 x 0.50	NE/SW	No archaeology found.
28	27 x 2 x 0.40	NNE/SSW	No archaeology found.
29	44 x 2 x 0.50	NE/SW	No archaeology found.
30	21 x 2 x 0.50	WNW/ESE	No archaeology found.
31	37 x 2 x 0.40	NE/SW	No archaeology found.
32	20 x 2 x 0.30-0.60	NE/SW	No archaeology found.
33	14 x 2 x 0.40-0.50	ENE/WSW	No archaeology found.
34	20 x 2 x 0.40	NW/SE	No archaeology found.
35	23 x 2 x0.30-0.50	NW/SE	No archaeology found.
36	36 x 2 x 0.30-0.40	NNE/SSW	No archaeology found.
37	17 x 2 x 0.30-0.40	E/W	No archaeology found.
38	39 x 2 x 0.40-0.50	NW/SE	No archaeology found.
39	16 x 2 x 0.40-0.50	ENE/WSW	No archaeology found.

Trench	L x B x D (m)	Orientation	Description
40	58 x 2 x 0.40	WNW/ESE	Possible pit investigated- found to be residual topsoil. No archaeology found.
41	24 x 2 x 0.40	NNE/SSW	No archaeology found.
42	32 x 2 x 0.30-0.40	NNW/SSE	No archaeology found.
43	35 x 2 x 0.30-0.40	NE/SW	No archaeology found.
44	34 x 2 x 0.30-0.40	NNE/SSW	No archaeology found.
45	36 x 2 x 0.30-0.40	NE/SW	No archaeology found.
46	27 x 2 x 0.30-0.40	NNE/SSW	No archaeology found.
47	27 x 2 x 0.30-0.40	ENE/WSW	Possible pit investigated- found to be natural subsoil variation. No archaeology found.
48	27 x 2 x 0.30-0.40	NW/SE	No archaeology found.
49	24 x 2 x 0.30-0.40	E/W	No archaeology found.
50	32 x 2 x 0.30-0.40	NW/SE	Spreads of redbrick which contained table wear pottery No archaeology found.
51	18 x 2 x 0.30-0.40	WSW/ESE	Spreads of redbrick which contained table wear pottery No archaeology found.
	1412 linear metres 2542 sq. m		

Table 3: Testing Results

5. DESCRIPTION OF ARCHAEOLOGICAL POTENTIAL

This archaeological impact assessment undertaken at Belcamp and Balgriffin, Malahide Rd, Dublin 17 (ITM 720204, 741440, Figure 1) has been prepared by Archer Heritage Planning Ltd for Gerard Gannon Properties. The report presents the results of test excavation which was undertaken under licence 21E0787 to the Department of Housing, Local Government and Heritage (DHLGH) in consultation with the National Museum of Ireland (NMI) on the 22nd to 24th November 2021 The following factors were identified:

- The subject site is large in scale with an area of c. 63 Hectares located due west of the Northern Cross on the Malahide Road.
- There is one SMR site located within the proposed development site, a ring-ditch (DU014-128) that was identified on aerial imagery
- No potential archaeological features were recorded in early maps of the subject site
- No previously unknown features of archaeological potential were noted during analysis of aerial photography
- No archaeological excavations have been undertaken previously within the subject site.
- There are no Protected Structures within the subject site.
- The subject site does not lie within an Architectural Conservation Area.

- A Geophysical survey (21R0190) was undertaken in Sept 2021. Areas of possible pits, enclosures and possible ring ditches were detected throughout the survey area. Of particular note is a potential double ring-ditch on the northern field boundary and a large enclosure containing possible pits.
- RMP DU014-128 was tested by two trenches (1 & 4), nothing of archaeological significance was uncovered. Variations in the subsoil, in particular a curved band of silty-clay, may explain the geophysical anomalies and the crop marks.
- No features of archaeological significance were recorded in the course of test excavation.

6. RECOMMENDATIONS

It is recommended that RMP DU014-128 is removed from the Record of Monuments and Places.

NOTE: All conclusions and recommendations expressed in this report are subject to the approval of The Department of Housing, Local Government and Heritage (DHLGH) and the relevant local authorities. As the statutory body responsible for the protection of Ireland's archaeological and cultural heritage resource, the DHLGH may issue alternative or additional recommendations.

7. REFERENCES

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Aerial Photography http://map.geohive.ie/mapviewer.html [accessed 18th Nov 2021]

Online Excavations bulletin www.excavations.ie [accessed 18th Nov 2021]

Online Archaeological Survey of Ireland www.archaeology.ie [accessed 18th Nov 2021]

National Inventory of Architectural Heritage www.buildingsofireland.ie [accessed 18th Nov 2021]

Placename information [accessed 18th Nov 2021]

Maeve McCormick

Maeve McCormick MSC

29th November 2021

APPENDIX 1: SMR/RMPS within 300m of subject site

RMP/SMR No.	Class	Townland	ITM Reference	Distance
DU014-128----	Ring-ditch	CLONSHAGH (Coolock By., Kinsaley ED)	720414, 741542	Within site
Located in a large arable field c. 405m SSE of triple-ditched enclosure (DU015-058----). An unnamed W-E running stream, a tributary of the Mayne River, is located c. 75m to the S. The ring-ditch can be seen on Google Earth coverage (24 June 2018) where it is visible as a positive cropmark. The ring-ditch is circular in plan (diam. c. 12.7m) defined by a ditch (Wth c. 1.6m). There is no clear evidence for an entrance gap across the ditch				
DU015-008----	Enclosure	MIDDLETOWN	719413, 742629	c.500m NW
The site is in a field of pasture north of Middletown House. Shown on the 1937 edition OS 6-inch map as circular in plan (diam. c. 35m). Not visible at ground level.				
DU015-033----	Ringfort - unclassified	BELCAMP	720673, 741301	c.50m S
Situated in the northwest corner of an open field under tillage that was formerly the playing pitches of Belcamp College. The site appears as a crop mark (c.12m diam.) on Bing aerial (viewed 27/01/2015) and is c.145m northwest of ringfort (DU015-116----). Not visible at ground level.				
DU015-056----	Ringfort - unclassified	SPRINGHILL	720144, 742210	c.300m N
Located on a south facing slope with an open field tillage west of Springfield House. An aerial photograph taken in 1992 (OS 8:7636) shows cropmark evidence for a single-ditched enclosure. It is also visible on Bing aerial (viewed 28 January 2015). Geophysical survey (Licence no. 08R0326) of the site was undertaken in advance of a proposed road realignment. A fragmented sub-circular enclosure measuring 39m in diameter with a probable entranceway to the east was identified. Several pit like responses suggestive of occupation were identified within the interior. Interpreted as a plough-damaged ringfort.				
DU015-058----	Enclosure	BURGAGE	720243, 741932	c.150m N
Situated on high ground within an undulating landscape. An aerial photograph taken by the OS in 1992 (Flight 8:7660) shows cropmark evidence for a triple-ditched enclosure comprising two inner circular ditches which are enclosed by a sub-circular enclosure. Geophysical survey (Licence no. 08R0023) was undertaken in advance of a proposed road realignment. Two concentric and symmetrical circular responses are encompassed within an outer sub-square response representing a probable trivallate enclosure. Outer enclosure 40m diam., the central 27m and the inner 12m diam. Few responses within the interior of the enclosures were identified. (Harrison 2008a). Not visible at ground level.				
DU015-116----	Ring-ditch	BELCAMP	720807, 741221	c.150mE
A circular ring-ditch visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Situated within an open field of tillage on what was once one of Belcamp College's playing pitches jc.70m north of a steep scarp which descends to a stream known as Belcamp River (Mac Shamhráin 1984, 141). There is a tradition of a ringfort on the grounds of the Oblate College at Belcamp Hall. It appears as a cropmark on an aerial photograph (OS 5092) and is visible on Bing aerial (viewed 27/01/2015). The cropmark is almost circular in plan (diam. c. 25m). Not visible at ground level.				
DU015-139----	Enclosure	BURGAGE	720401, 741709	<50m N
Located in a large arable field c. 1km SE of the complex of monuments at Springhill townland focussed on enclosure (DU015-057----). An unnamed W-E running stream, a tributary of the Mayne River, is located c. 23m to the N. The enclosure can be seen on Google Earth coverage (24 June 2018) where it is visible as a positive cropmark. The enclosure is subcircular in plan (ext. diams. c. 35.6m N–S and c. 33.9m E–W) and surrounded by a ditch (Wth c. 2m). There is no clear evidence for an entrance gap through the bank.				
DU015-141----	Ring-ditch	SAINTDOOLAGHS	720459, 741957	c.250m N
Located in a large arable field c. 217m E of a triple-ditched enclosure (DU015-058----), the ring-ditch lies c. 570m S and SE of a complex of enclosures and ring-ditches in the townland of Springhill. The ring-ditch is visible on Google Earth imagery (24 June 2018). The site is circular in plan (ext. diam. c. 5.8m) defined by a ditch (Wth <1.m). There is no evidence for an entrance gap through the ditch.				

APPENDIX 2 Previous Archaeological Excavations

Any excavation which recorded nothing of archaeological significance has been omitted from this list.

<table>
<tr><th>Licence</th><th>OS Ref</th><th>Townland/ Street</th><th>Ex. Bull. Ref.</th><th>Author</th></tr>
<tr><td>08E0529</td><td>720245,
741955</td><td>Belcamp, Springhill and Kinsaley, Dublin</td><td>2008:373</td><td>Melanie McQuade</td></tr>
<tr><td colspan="5">Test excavations were undertaken at three locations along the proposed route of the Malahide distributor road. A series of 2m-wide trenches were excavated within each of the areas in order to test the results of a geophysical survey (08R0023).

At Belcamp trenches were excavated in a large tilled field where topsoil was an average of 0.35m deep. A trench measuring 80m and two offsets, 15m and 30m long respectively, were excavated across a series of linear ditches identified by the geophysical survey. Most of these were post-medieval land drains. They were orientated north-west/south-east and were an average of 0.8m wide. A pit (0.85m by 0.9m) filled with cockleshell was also uncovered. The geophysical survey had identified a potential prehistoric site 108m to the north-west. An 80m trench and a 20m offset were excavated here with additional areas opened in order to define the extent of archaeological features within the road-take. A large pit 2.5m by 2.05m and 0.3m deep, two smaller pits and a linear feature were uncovered within an area measuring 10m by 7m. All of these features were filled with charcoal-rich silty clay and burnt stones.

At Springhill trenches were excavated at the top of a hill and along its south-facing slope. Here a 140m-long trench and three offset trenches (10m and 20m long) were positioned at the location of significant geophysical responses. A furrow, a linear field drain of indeterminate date and an 18th/19th-century occupation deposit were uncovered beneath 0.35–0.5m of topsoil.

At Kinsaley a 90m-long trench and five offsets measuring 10–13m were excavated on the summit of a hill and on its north-facing slope. Topsoil was an average of 0.33m deep but was 0.90m deep down-slope. A shallow pit, 1.33m by 0.8m, with a charcoal-rich fill was uncovered at the top of the hill. Another similarly sized pit was uncovered 27m further south where three field drains, at least two of which were post-medieval in date, were also uncovered. An ex situ sherd of prehistoric pottery was recovered towards the base of the hill.</td></tr>
<tr><td>16E0193</td><td>720679,
741277</td><td>Belcamp, Balgriffin, Dublin 17, Dublin</td><td>2016:029</td><td>Gill McLoughlin</td></tr>
<tr><td colspan="5">Testing was carried out at the site of a proposed mixed-use residential and commercial development at Belcamp Hall, Balgriffin, Co. Dublin in response to a request for further information from Fingal County Council (Planning Refs.: Fingal Co. Co. F15A/0609, Decision order PF/0263/16). The assessment incorporated the results of a geophysical survey of the development area and test trenches were placed based on the results of that survey.

The proposed development site is located to the north of the N32 and north of the Mayne River and is bounded to the east by the R107 (to Kinsaley and Malahide) and to south-east by existing industrial development. It comprises the lands of the former 18th-century demesne of Belcamp Hall and was in use as a school until 2009 (Belcamp College), which was run by the Oblate Fathers since 1893. Two archaeological sites are recorded within the proposed development area boundary, the site of a ringfort (DU015-033) and a ring-ditch (DU015-116).

Testing took place over 4 days from 3 May 2016 and no features, finds or deposits of archaeological significance were identified. The sites DU015-033 and DU015-116, which were previously thought to be a ringfort and a ring-ditch respectively, have been shown, as a result of test trenching, to be early modern landscape design features, possibly tree-rings.

In total 18 test trenches were excavated within the greenfield area in the eastern half of the proposed development site, to determine the nature, date and extent of the cropmark sites and to investigate potential landscape design features identified on aerial photography. These features were thought to relate to the entrance alignment of an earlier house at the site. Testing also targeted other potential features identified during the geophysical survey.

In general the topsoil was 0.3m deep across the field and contained many 19th- and 20th-century finds such as delph, glass, brick fragments, sea shells and nails. For the most part the topsoil overlay compact yellow silty sand with occasional variations to yellow sandy clay and yellow grey sandy gravel in places. No features or finds of archaeological significance were identified in any of the test trenches. Modern agricultural furrows oriented east-north-east/west-south-west were identified throughout the field and in trench T5 an earlier set of furrows were also identified oriented north-south. Other than the furrows, the natural subsoil was sterile and had the appearance of having been reduced or levelled somewhat in the past and this corresponds well with the field having been previously used as playing pitches for the school.</td></tr>
</table>

<table>
<tr><th>Licence</th><th>OS Ref</th><th>Townland/ Street</th><th>Ex. Bull. Ref.</th><th>Author</th></tr>
<tr><td colspan="5">Trench 16 was placed to assess enclosure DU015-033 which was indicated through aerial photography and geophysical survey. Two ditches were identified in the trench corresponding to the results of the geophysical survey. Two sections were hand excavated across the ditches which were found to measure a maximum of 2.25m in width and 0.6m in depth. The fills of these two ditch sections indicated that they were the same feature and the enclosure indicated on the geophysical survey and aerial photographs. The ditch sections each contained three fills. The upper fill (C14) comprised a loose brown deposit similar to topsoil, 0.1m deep. Below C14 most of the ditch was filled with what appeared to be redeposited natural subsoil which contained snail shells, sea shells (oyster), red bricks, glass and slate fragments (C15). The basal fill (C16) was a clayier version of C15 and contained similar finds to those recovered from C15. A stone drain (C18) was also present within this ditch, along the outer edge in both sections excavated, and it appeared from the fills that it was part of the original construction of the ditch feature. The combination of the modern finds recovered from the fills and the drain within the outer edge suggest that this feature is an early modern landscape design feature, rather than a ringfort as was previously thought. Based on the testing results this enclosure has an outer diameter of c.14m.

Trench 11 was placed to assess enclosure DU015-116 which was also indicated through aerial photography and geophysical survey. Two ditches were identified in the trench corresponding to the results of the geophysical survey. Two sections were excavated across the ditches with the careful assistance of a mechanical digger guided by hand excavation and were found to measure a maximum of 2.7m in width and 1m in depth. The fills of these two ditch sections corresponded with each other, indicating that they were the same feature as the enclosure indicated on the geophysical survey and aerial photographs. The basal fill (C12) was a gritty grey clay 0.08m deep and it was overlaid by a pure yellow grey silty clay 0.18m deep (C10). Above C10 was a deposit of grey-yellow silty clay 0.18m deep with frequent inclusions of snail shells and some inclusions of red bricks (C9). Above C9, C8 made up the bulk of the fill of the ditch. C8 was 0.3m deep comprised yellow clayey silt with frequent small stones and snail shells. This deposit appeared to be comprised of redeposited natural subsoil. Above C8 was a deposit of mid-brown soft sandy silt 0.14m deep with some modern inclusions (C7). The ditch was sealed by a dark brown deposit localised to the ditch with frequent modern inclusions (C6). Like enclosure DU015-033, a stone drain (C13) was also present within this ditch, along the outer edge in both sections excavated, and it appeared from the fills that it was part of the original construction of the ditch feature. The combination of the modern finds recovered from the fills and the drain within the outer edge suggest that this feature is an early modern landscape design feature, rather than a ring ditch as was previously thought. Based on the testing results this enclosure has an outer diameter of c.24m.

Faint responses suggestive of a further enclosure were identified in the geophysical survey in the east of the area and trenches T2, T3 and T4 were placed to investigate these anomalies. Variations in the natural subsoil present in trenches T3 and T4 may have caused these responses and test sections excavated through these variations confirmed the deposits as natural subsoil.</td></tr>
<tr><td>04E1371</td><td>721725,
741525</td><td>BALGRIFFIN PARK, DUBLIN, Dublin</td><td>2004:0513</td><td>Gill Mc Loughlin</td></tr>
<tr><td colspan="5">Testing was carried out at Balgriffin, between 27 September and 6 October 2004, in advance of a housing development. Trenches were arranged to investigate anomalies detected during a geophysical survey carried out in May 2003 (licence 03R053). Testing was also carried out in a field that was too overgrown for geophysical survey, most of which lay inside the constraint circle for the site of a church.

No features of archaeological significance were uncovered in the field to the west of the church site. Two areas of archaeological potential were uncovered in the field that mostly occupied the RMP constraint circle. A spread of burnt stone and dark-grey silty clay was uncovered in the south of the field, close to the river. This deposit may be the remains of a burnt mound. Further north in this field, two shallow deposits of grey silty soil containing occasional animal bone and charcoal were noted. Several sherds of medieval pottery were found in this area and an early medieval glass bead was found on the surface of one of the deposits. These deposits were located in areas that were to be left as open spaces, so they were fenced off to be preserved in situ.

In the field to the east of the church site a substantial curving ditch was uncovered. This ditch measured 4.75m wide and more than 1.3m deep and appeared to be enclosing the area to the west (i.e. the site of the church).

Additional testing was requested to establish if there was anything of archaeological significance within the area to the west of the ditch. This was carried out on 1 and 2 December 2004. Two smaller linear ditches uncovered in the additional trenches contained similar fills to the large curving ditch and may have been associated with it. No burials or other features that would confirm the ditch as an enclosing ditch related to the site of the church were uncovered in the area tested. However, it remains likely that this ditch is an enclosing feature related to the church.</td></tr>
</table>

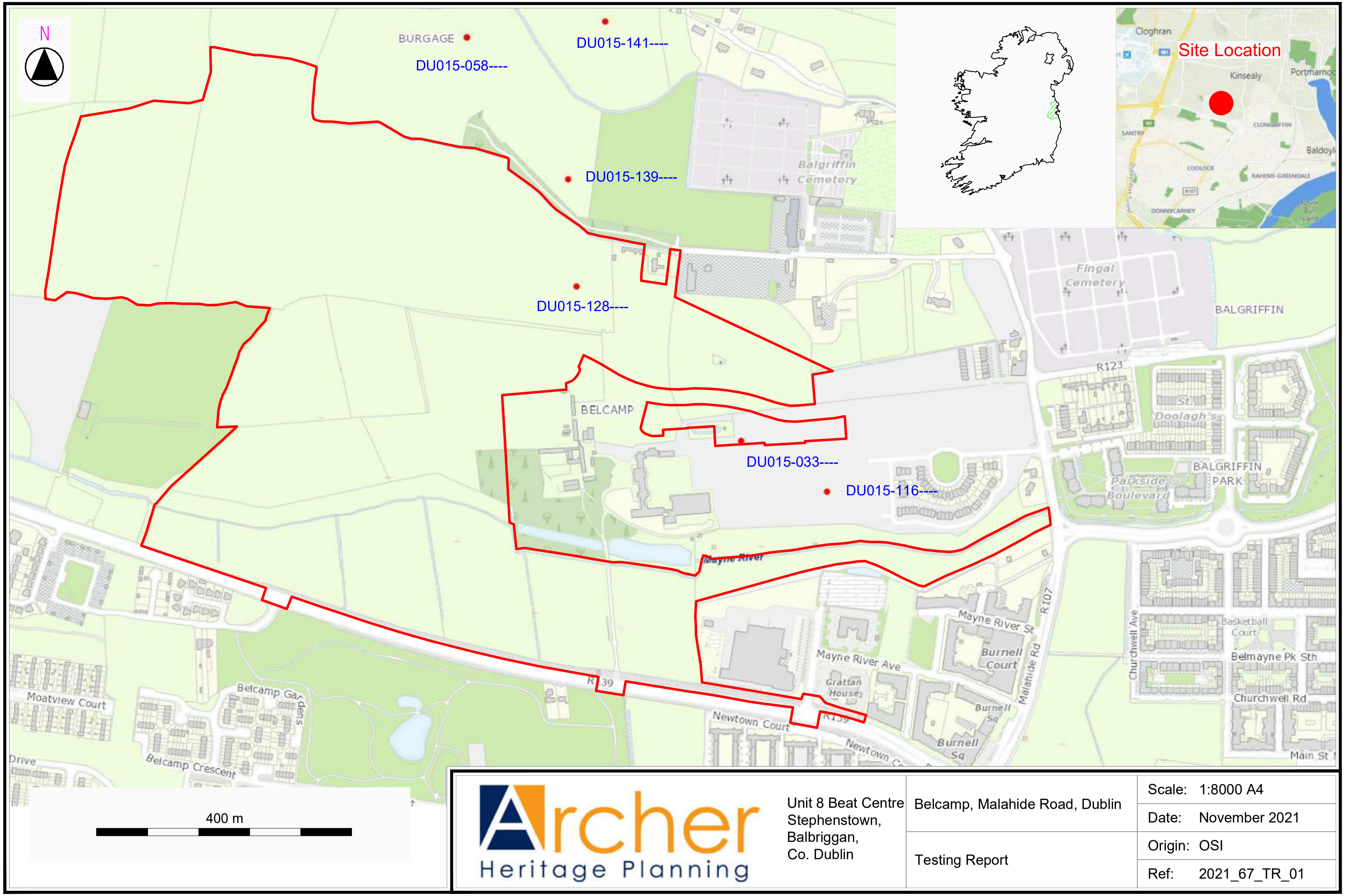
<table>
<tr><th>Licence</th><th>OS Ref</th><th>Townland/ Street</th><th>Ex. Bull. Ref.</th><th>Author</th></tr>
<tr><td>05E0212
AND EXT</td><td>721412,
741306</td><td>BALGRIFFIN PARK, Dublin</td><td>2005:384</td><td>Tim Coughlan</td></tr>
<tr><td colspan="5">In September 2000, an assessment was carried out by Georgina Scally (Excavations 2000, No. 238, 00E0714) in advance of the construction of the North Fringe Sewer, which lay to the south of the demolished Balgriffin House (SMR 15:62) and the site of a church (SMR 15:12). No finds or features of archaeological significance were uncovered.
Gill Mc Loughlin recently carried out a series of investigations on the site immediately to the north of the proposed development (Excavations 2004, No. 513, 04E1371). In one area a series of linear and curvilinear ditches were identified. Testing and partial excavation of these features suggests that their fills were largely sterile, although occasional sherds of medieval pottery were recovered. It is thought that this may be a large possible enclosing ditch that may be associated with the known sites, while the other features appear to be associated with drainage/land boundaries.
Phase 1 of testing under this licence commenced at the site on 8–9 March 2005. This was carried out using a 13-tonne tracked excavator with a flat toothless bucket. In total, 1326 linear metres of trenches were investigated across the proposed development area. The trenches were arranged to investigate any anomalies that may have existed along the line of a number of roads in the proposed development. No features of archaeological significance were uncovered in the test-trenches.
Phase 2 of test-trenching commenced at the site on 23 June 2005 and lasted for four days. This was carried out using a 20-tonne tracked excavator with a flat toothless bucket. In total 2200 linear metres of trenches were mechanically investigated along specific roads across the proposed development area. The trenches were arranged to investigate any potential archaeological material that may exist along the route of a number of roads within the proposed development. No features of archaeological significance were uncovered in the test-trenches, with the exception of Trench 16 at the south of the development. Four features were recorded along the length of this trench (Area A) and these were excavated during August 2005.
Features in Area A were spread over c. 100m and consisted of a series of ditches, drains and some pits. These ditches were all relatively shallow, the deepest of them being 0.48m deep, and they probably functioned as drains. Some of the more substantial ditches appear to relate to each other and may have functioned as field boundaries/drains. These ditches are parallel to each other and also to existing field boundaries in the surrounding area. No datable finds were recovered from any of the ditches.
A number of other features were also discovered during monitoring of topsoil-stripping in the southern part of the proposed development area (Areas B and C) and were also excavated during August 2005. The pits located in Areas B and C show evidence of burning and dumping of burnt material in the past, but no datable finds were recovered from any of the pits. In the absence of any datable material, it could be assumed that these pits are related to the various field boundaries, ditches and drains as uncovered in Area A.</td></tr>
<tr><td>05E0212 ext.</td><td>721625,
740950</td><td>Balgriffin Park, Dublin</td><td>2007:425</td><td>Gill McLoughlin</td></tr>
<tr><td colspan="5">During monitoring of a large residential development at Balgriffin Park in July 2007 (previously tested by Tim Coughlan, Excavations 2005, No. 384), a number of post-medieval garden features were discovered within the southern section of the development area. These were subject to excavation and consisted of a section of well-constructed stone pathway and the remains of foundations likely to be associated with a greenhouse and a well, all of which were located within the remains of a walled garden. No other features or artefacts of archaeological potential were discovered.
A significant portion of the wall surrounding the garden was still intact during excavation works and was constructed of red brick, although it was very overgrown in places. Although this garden is within the townland of Balgriffin, it was associated with Newgrove House, which stood within its own demesne to the south of Balgriffin Park. The first-edition OS map shows access from Newgrove to the garden past a number of small outbuildings, as well as access from the road to the east. The northern wall of the garden is located along the boundary with the original demesne of Balgriffin Park.</td></tr>
<tr><td>N/A</td><td>721231,
741500</td><td>'St Doulagh's', Balgriffin, Dublin</td><td>1989:021</td><td>D.L. Swan</td></tr>
<tr><td colspan="5">Archaeological excavations were undertaken at St Doulagh's Church last September as part of a continuing conservation and restoration project. This work was concentrated on three areas:1. The area surrounding and in the immediate vicinity of the baptistery and the vault containing the holy well; 2. the line of a long trench, opened mechanically and without archaeological supervision, which intersected the site more or less diagonally; 3. the area</td></tr>
</table>

<table>
<tr><th>Licence</th><th>OS Ref</th><th>Townland/ Street</th><th>Ex. Bull. Ref.</th><th>Author</th></tr>
<tr><td colspan="5">within the present church yard.1. Showed signs of considerable disturbance in all cuttings, and yielded only one significant feature. This consisted of a carefully constructed bath or trough, measuring 1.8m x 0.75m with a depth of 0.6m. It was fed through a channel with the overflow of water from the spring inside the baptistry, and this flow in turn could be controlled to feed through a sluice into the underground vault which also contained the holy well.From this area a number of coins and tokens were recovered, including some from the spring of the baptistry, of which the oldest was a posthumously minted silver penny of Henry VIII. Small quantities of pottery fragments of all dates from the l3th/l4th centuries onwards were recovered from many cuttings here, as well as small quantities of slag.2. The line of trenching which had been opened mechanically revealed archaeologically significant deposits in a number of areas, including stratified occupation debris, indications of both inner and outer enclosing ditches, and an area of burial, This latter contained at least six extended human burials in very shallow grave pits, directly beneath the plough-soil, These were adult burials. No artefacts were recovered, nor was any pottery noted in this area. Some slag was, however, identified as associated with the occupation area.3. Trenching within the modern churchyard showed evidence that part, at least, of the accumulated deposits of burials here had been almost completely removed, thus lowering the ground level considerably. Only the bases of the grave trenches survived, and in most cases any human remains recovered were disarticulated and extremely disturbed. It is likely that this activity was associated with the extensive reconstruction works which took place during the latter part of the last century.Supervision of operations still continues, but since the site is to be taken in charge by the Parks Department of Dublin Co. Council, further major excavations of the site are not at present envisaged.</td></tr>
<tr><td>N/A</td><td>721231,
741500</td><td>St Doulagh's', Balgriffin, Dublin</td><td>1990:002</td><td>Eoin Halpin</td></tr>
<tr><td colspan="5">The series of trial excavations carried out on behalf of Historic Monuments and Buildings Branch, DOE(NI), in September 1990 showed clearly that the site at Ballyshanaghill is an Early Christian, circular, univallate occupation site i.e. a rath. It was constructed by dumping the excavated ditch material to form an enclosing bank. The interior is slightly dished in shape but generally slopes downwards from east to west. Unusually, the deepest overburden of topsoil is towards the eastern or up-slope side. Here there is no evidence that cultivation ridges, noted in two of the four excavated trenches, touched the intriguing evidence for the presence of a possible palisade trench as well as other features, including the presence of up to 0.1m of occupation soils sealed beneath the primary bank-wash deposits. Lastly, this long section also revealed extensive pre-bank activity as well as the fascinating possibility that archaeological deposits survive beyond the limits of the rath. In conclusion, this site consists of complex. multi-period archaeology the most obvious of which is the construction of a rath in the Early Christian period. Good evidence for the internal structural layout of a rath appears to survive as well as a wide variety of finds. There is also an opportunity for a rare examination of the occupational history of a site prior to the construction of a rath. Excavation is due to continue in February-March 1991.</td></tr>
<tr><td>N/A</td><td>721231,
741500</td><td>*'St Doulagh's', Balgriffin, Dublin</td><td>1990:031</td><td>D.L. Swan</td></tr>
<tr><td colspan="5">Two further periods of excavation were undertaken at this site during 1990 (See Excavations 1989, 18). These were necessitated by the removal of the tiled flooring of the chancel, and the disturbance of the underlying deposits in March, and by the opening of a drainage trench from north of the vault across the length of the site after the crop had been lifted in August.
The deposits beneath the old tiling had been totally disturbed, to a depth of almost 0.75m, and much disarticulated bone, together with mortar and rubble was encountered. Two fragments of roof tiling were recovered, one deeply scored and both with traces of green glaze on their outer surfaces.
An opportunity was afforded to examine some details of the construction of the walls of the early chancel, as sections were opened along their inner faces exposing the foundation courses. Along the south wall, a foundation trench 0.55m deep had been cut into the boulder clay, at the base of which a mantling of pebbles was laid. Above this, a rough paving of large, flat stones had been laid, forming the base of the wall. On this paving, a foundation of rough, uncoursed masonry rose for 0.4m to 0.45m, above which was the finely coursed masonry of the wall proper. The remnants of an early burial were set into the boulder clay at the lowest level, predating the construction of this wall.
The inner face of the north wall of the chancel had been partly dismantled to allow for a large recess with a pointed arch, which had been set into the thickness of the wall. Clearance here revealed a solid masonry plinth at a depth of 0.52m below the old flooring, upon which a complete skeleton was laid. The skull, however, had been set into a recess, consisting of a single stone with a rectangular section cut through its mass, placed in an upright position on the plinth, so that the head of the burial was completely protected, and only the face could have been viewed prior to burial. This is an unusual variation of a common, late medieval type of formal burial.</td></tr>
</table>

Licence	OS Ref	Townland/ Street	Ex. Bull. Ref.	Author
The section of the trench cut to the north of the vault revealed a well-defined ditch at a point 12.8m from the vault face. This ditch is best interpreted as part of the enclosure revealed to the south of the site in last year's excavations. The site has now been taken over by Dublin County Council as an Historic Park.				

APPENDIX 3 Protected Structures in the surrounding area

FCC Ref No	NIAH Reg No	Structure	Location	Date	Distance
0463	11350024 11350040 11350035 11350036 11350037 11350025	Belcamp Hall Belcamp College,	Belcamp Hall Belcamp College, N32 Road, Belcamp, Balgriffin, Dublin 17	1770 - 1780	c.250m E
Former Belcamp College school complex (incl 18th century original house, Washington Monument, walled garden, bridge & early 20th century chapel)					
0789	N.A	House	Belcamp Hutchinson Carr's Lane, off Malahide Road ,Belcamp, Balgriffin, Dublin 17	18thC	c. <50m NE
18th century five-bay three-storey house, walled garden and gate lodges					
0459	11350016	St. Doulaghs Church & Well & St. Catherine's Well	Malahide Road, Saintdoolaghs, Balgriffin,	1860-65 (Church) 1200-1400 (well)	c.300m N
Medieval stone church with tower church (with 19th century interventions). Set within graveyard with stone cross at entrance on road and two holy wells in adjoining lands (St. Doolagh's Well is enclosed in an octagonal building, St. Catherine's Well is within a rectangular vaulted building)					
0460	11350019	House	St. Doolaghs Park Malahide Road, Saintdoolaghs, Balgriffin, Dublin 17	1840-1860	C.300m N
19th century five-bay two-storey house and walled garden (no longer private residence, permission granted for conversion to nursing home)					
0461	11350018	Gate lodge of St Doolaghs, Park	Malahide Road, Saintdoolaghs, Balgriffin, Dublin 17	1840-1860	c.300m N
19th century former Gate lodge to St Doolaghs Park (now in separate ownership)					
0462	11350029	Milestone	Malahide Road, Saintdoolaghs, Balgriffin, Dublin 17	1825-1875	c.300m N
19th century cast-iron milestone in entrance wall to Lime Hill House					
0468	11350021	House	Wellfield House Malahide Road, Saintdoolaghs, Balgriffin, Dublin 17	1780-1800	c.300m N
Late 18th or early 19th century five-bay two-storey house with belvedere					
0792	11350013	House	Springhill Limekiln Lane, off Malahide Road (R107), Springhill, Balgriffin, Dublin 17	1780-1820	c.300m N
Early 19th century house and stone outbuildings					
N/A	11349005	House	Belcamp House, BELCAMP,	1820-1860	c.400m W
Detached three-bay two-storey house, c.1840, with central portico. ROOF: M-profile double pitched slate roof; rendered chimney stacks; terracotta pots. WALLS: Pebble dashed; nap rendered plinth coourse. OPENINGS: Ionic columns to portico; square headed openings; stone cills; uPVC casements.					



Archer Heritage Planning

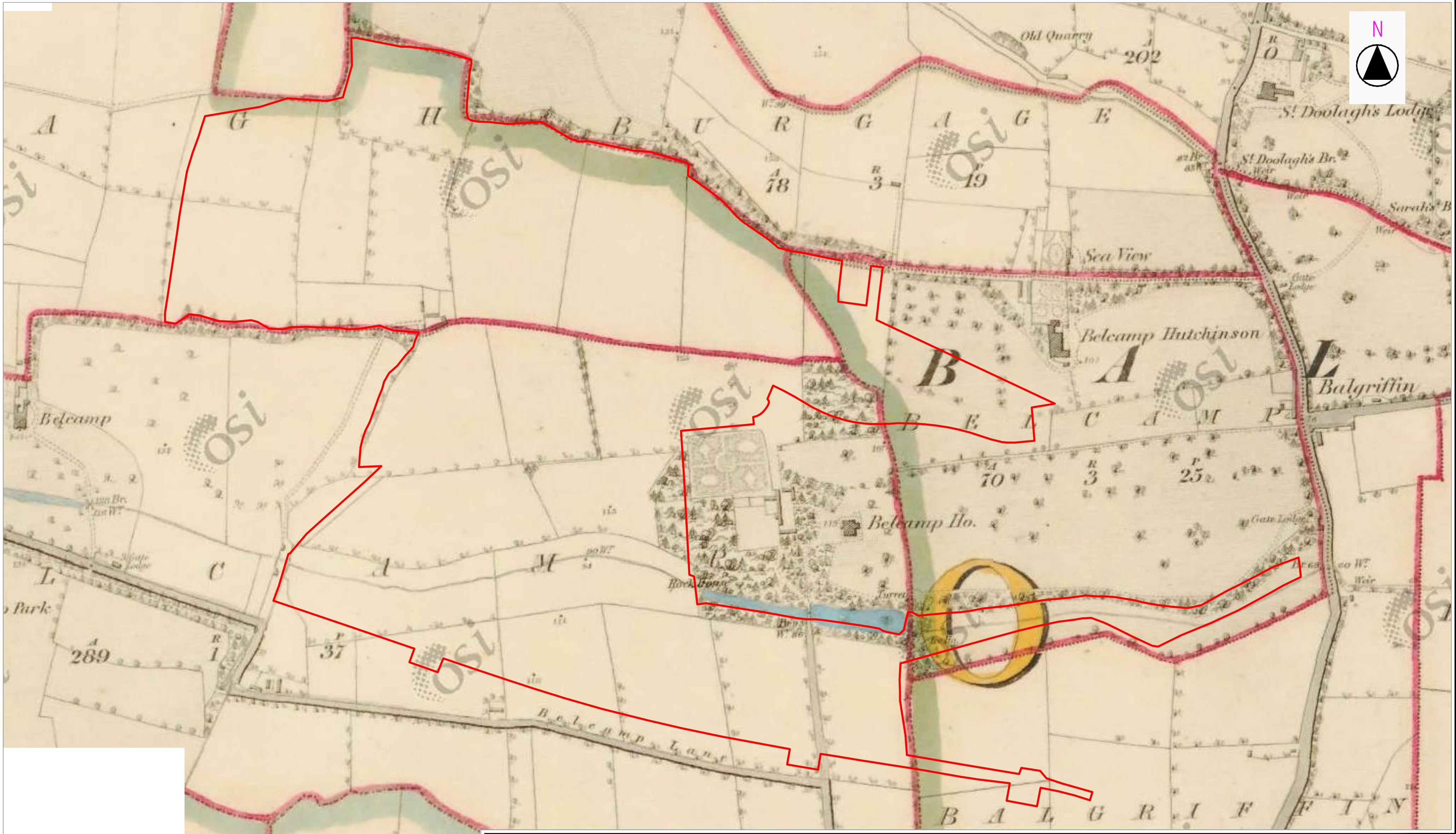
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide Road, Dublin

Testing Report

Scale:	1:8000 A4
Date:	November 2021
Origin:	OSI
Ref:	2021_67_TR_01

Figure 1: Location of site and surrounding RMPs



Archer Heritage Planning

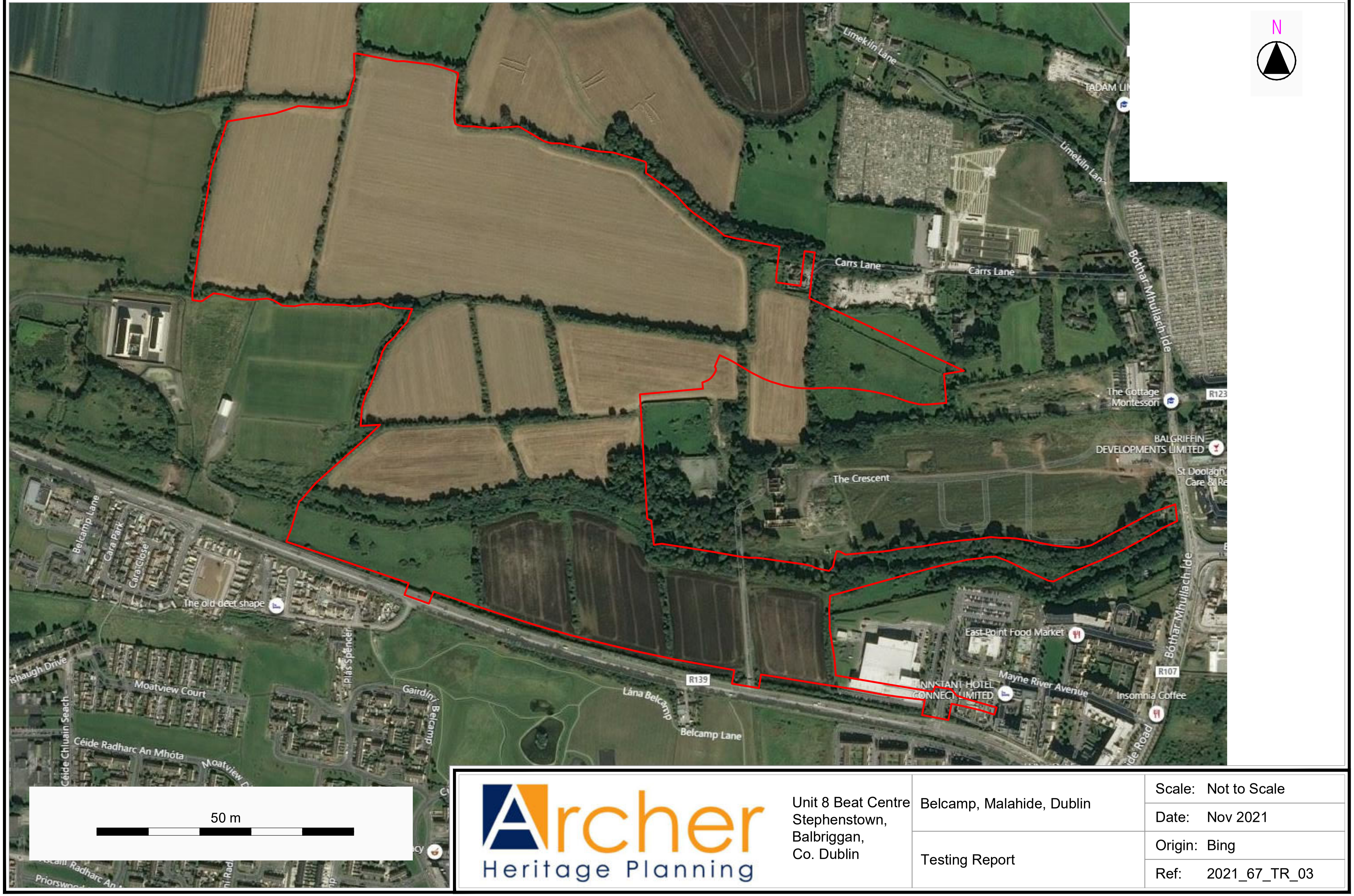
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Dublin

Testing Report

Scale:	Not to Scale
Date:	Nov 2021
Origin:	OSi
Ref:	2021_67_TR_02

Figure 2: Extracts from 1st Edition OS Map (1837)



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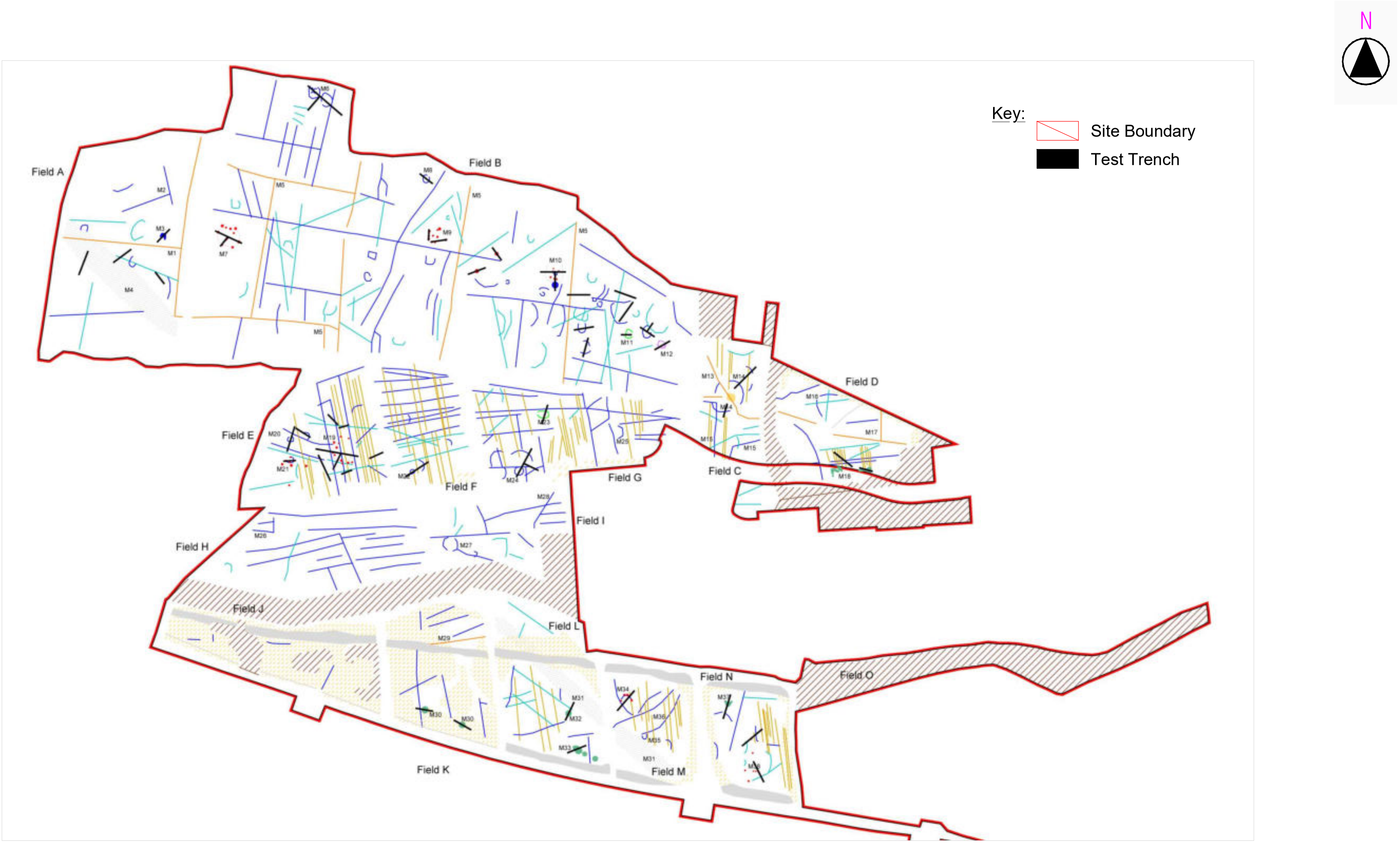
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Dublin	Scale: Not to Scale
	Date: Nov 2021
Testing Report	Origin: Bing
	Ref: 2021_67_TR_03

Figure 3: Extracts of Aerial Photography (Bing 2021)



Legend

- Basemap
- Geophysical Survey Area
- Unsurveyable Area
- 🟪 Archaeology
- 🟪 Probable Archaeology
- 🟦 Possible Archaeology
- 🟥 Possible Pits
- 🟩 Possible Stone Feature
- 🟦 Trend
- 🟧 Feature on Historic OS
- 🟨 Cultivation
- 🟨 Modern Disturbance
- ⬜ Modern Pipe
- ⬜ Overhead Wires Disturbance
- 🟩 Highly magnetic Response - Unknown Origin

Archer Heritage Planning

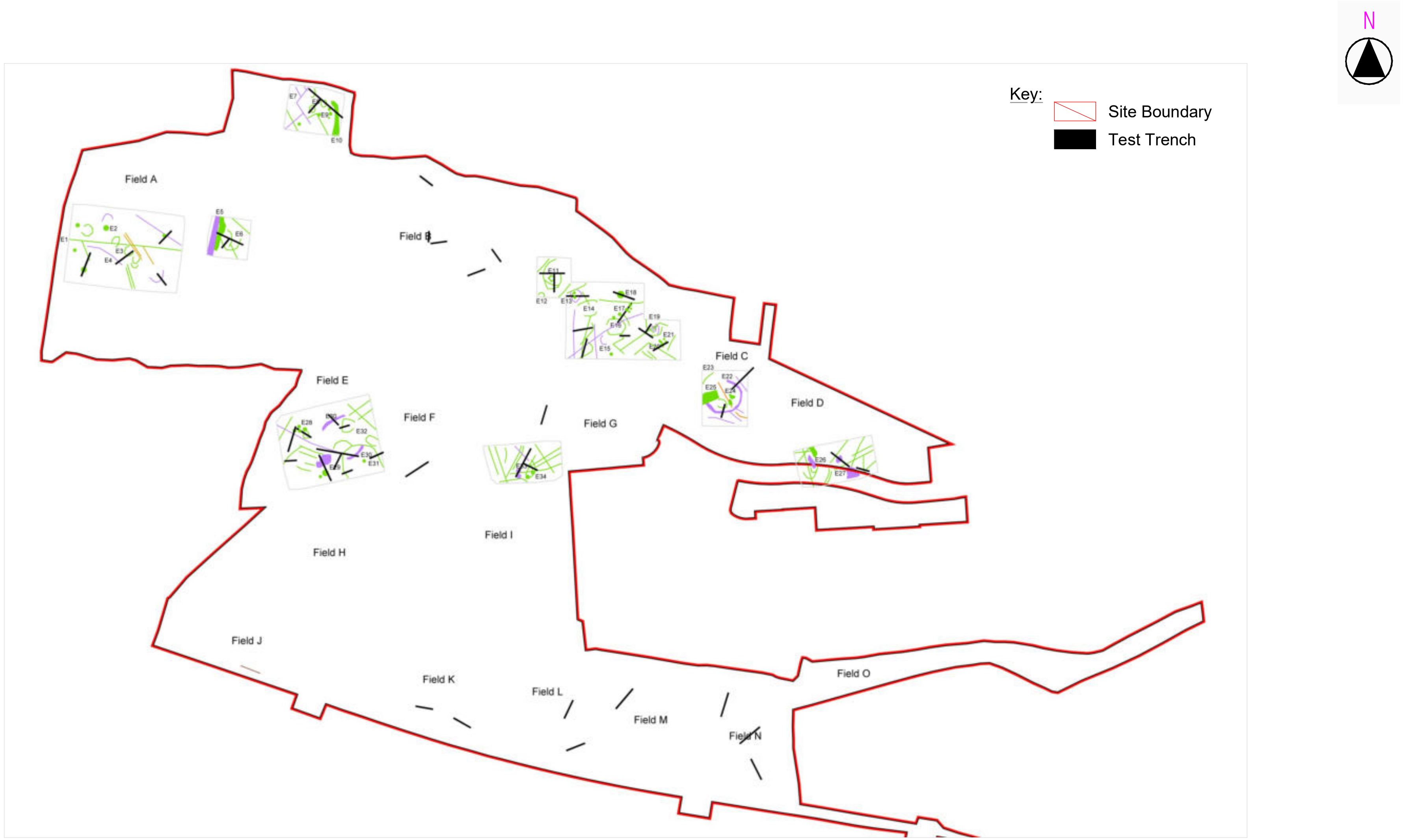
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide Road, Dublin

Testing Report

Scale:	Not to Scale
Date:	November 2021
Origin:	Earthsound
Ref:	2021_67_TR_04

Figure 4: interpretation plot of gradiometry survey



Archer Heritage Planning

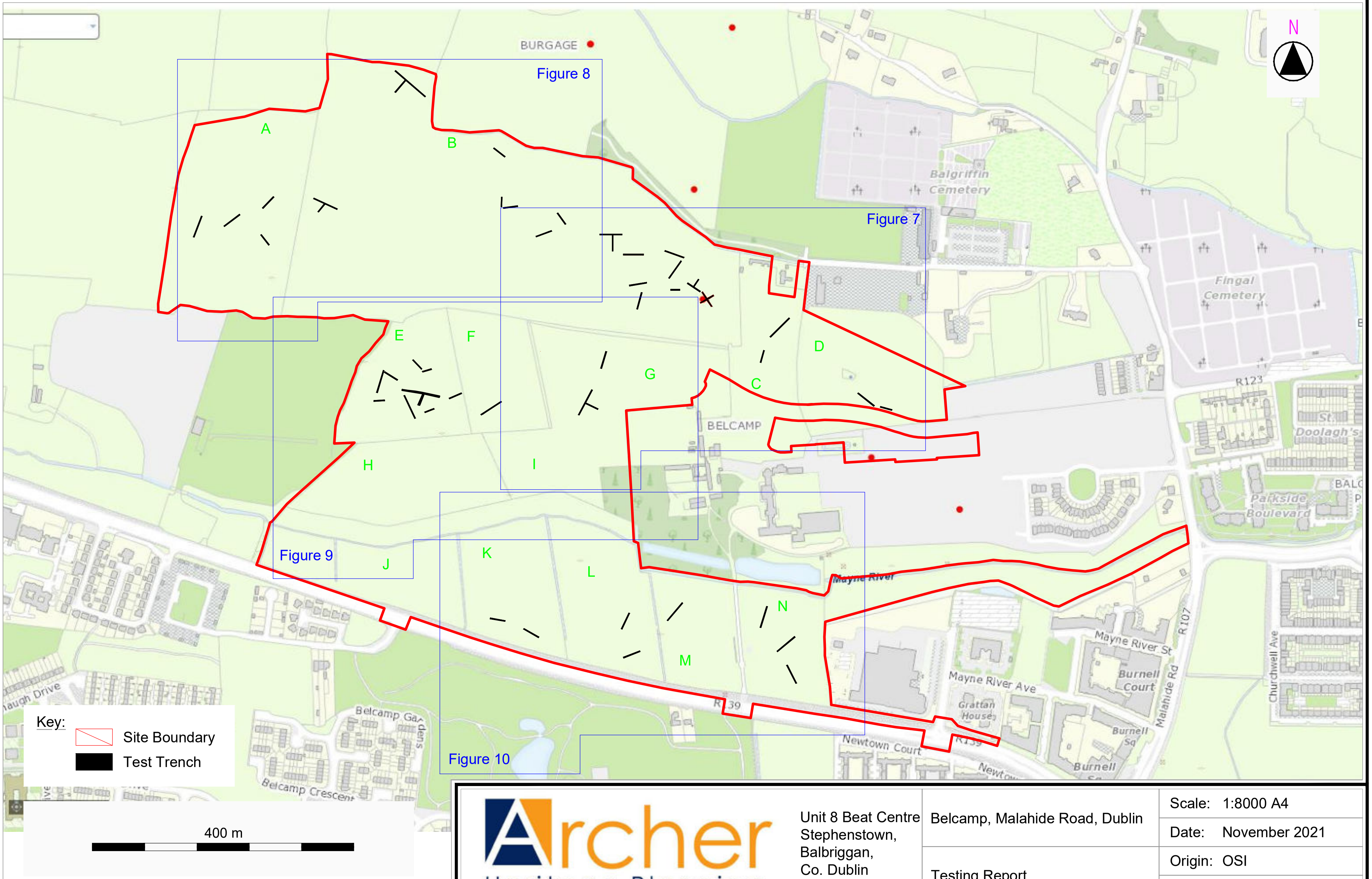
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide Road, Dublin

Testing Report

Scale: No to Scale
Date: November 2021
Origin: Earthsound
Ref: 2021_67_TR_05

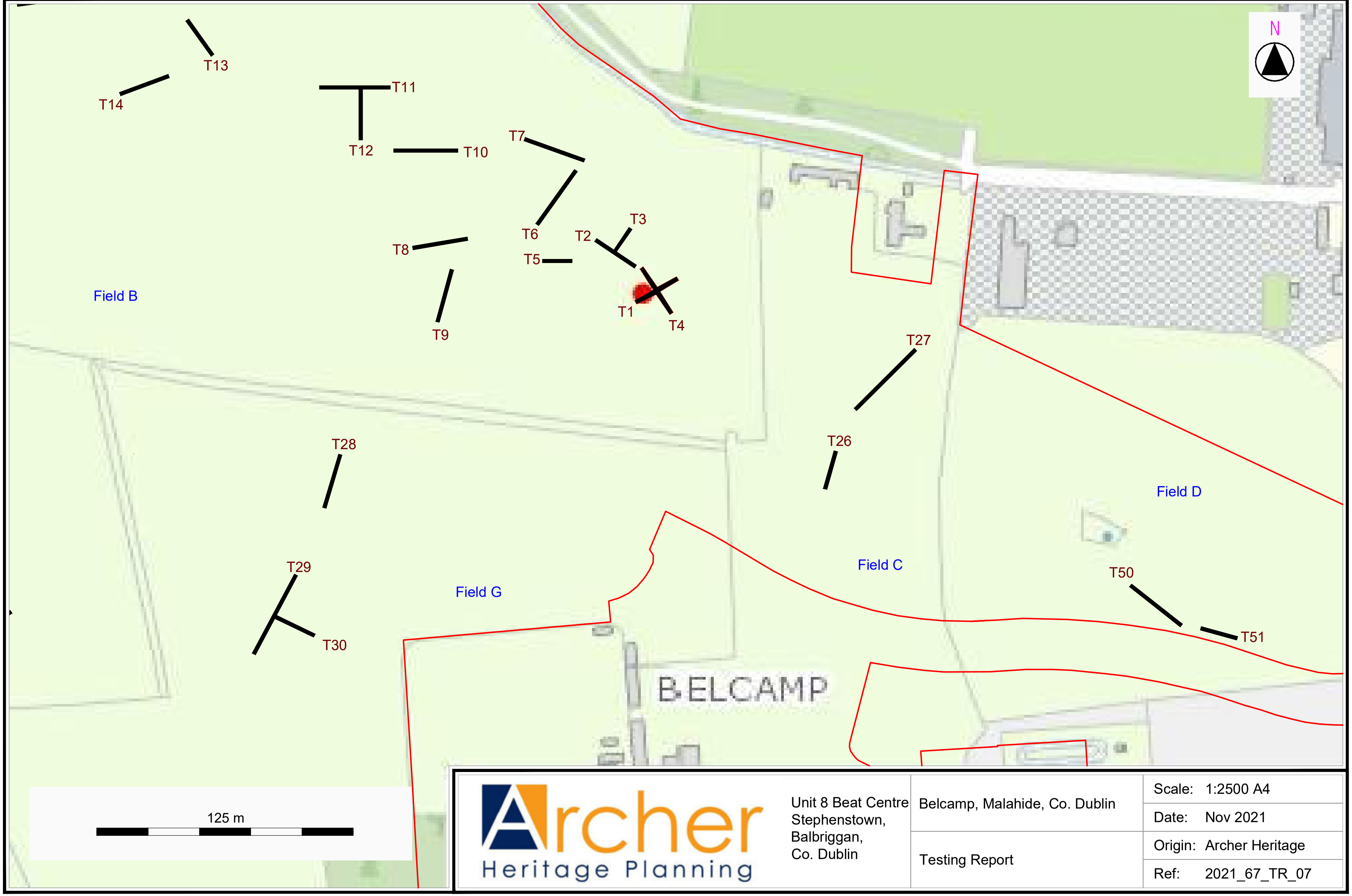
Figure 5: Interpretation plot of resistivity survey



Unit 8 Beat Centre Stephenstown, Balbriggan, Co. Dublin	Belcamp, Malahide Road, Dublin
	Testing Report

Scale: 1:8000 A4
Date: November 2021
Origin: OSI
Ref: 2021_67_TR_06

Figure 6: Test Trench Layout Overview



Archer Heritage Planning

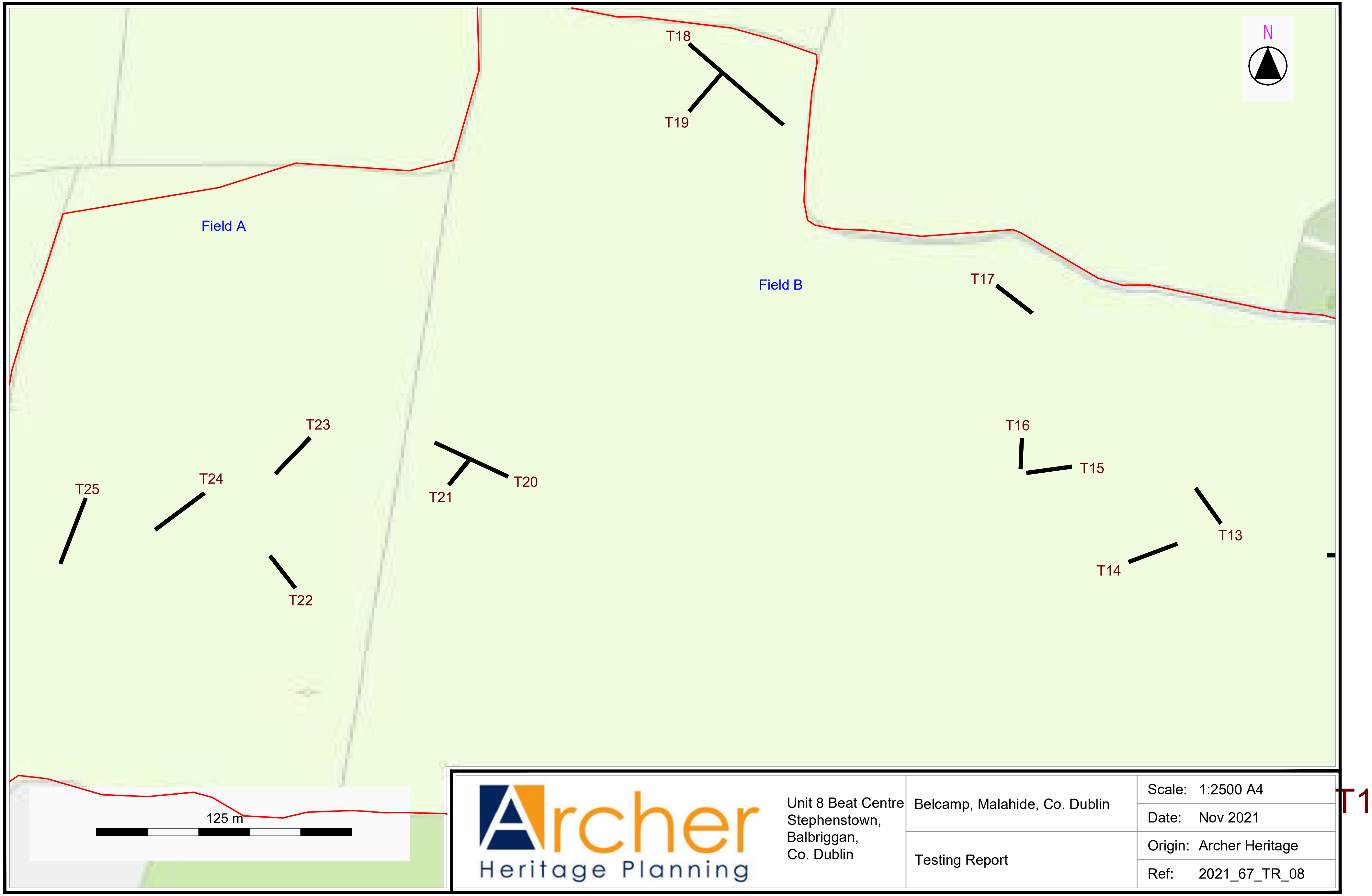
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Co. Dublin

Testing Report

Scale: 1:2500 A4
Date: Nov 2021
Origin: Archer Heritage
Ref: 2021_67_TR_07

Figure 7: Test Trench Layout (i)



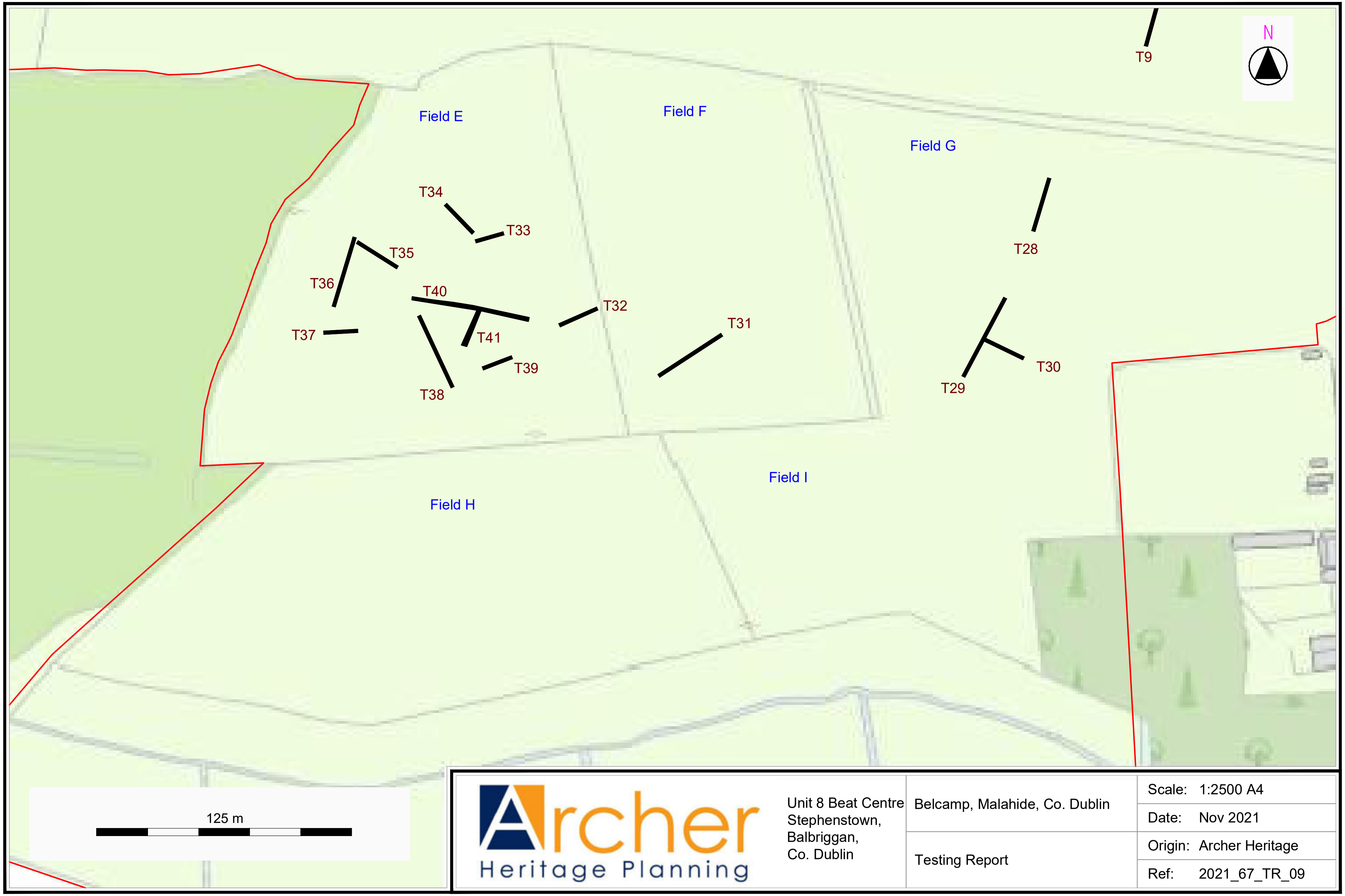
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Co. Dublin

Testing Report

Scale: 1:2500 A4
Date: Nov 2021
Origin: Archer Heritage
Ref: 2021_67_TR_08

Figure 8: Test Trench Layout (ii)



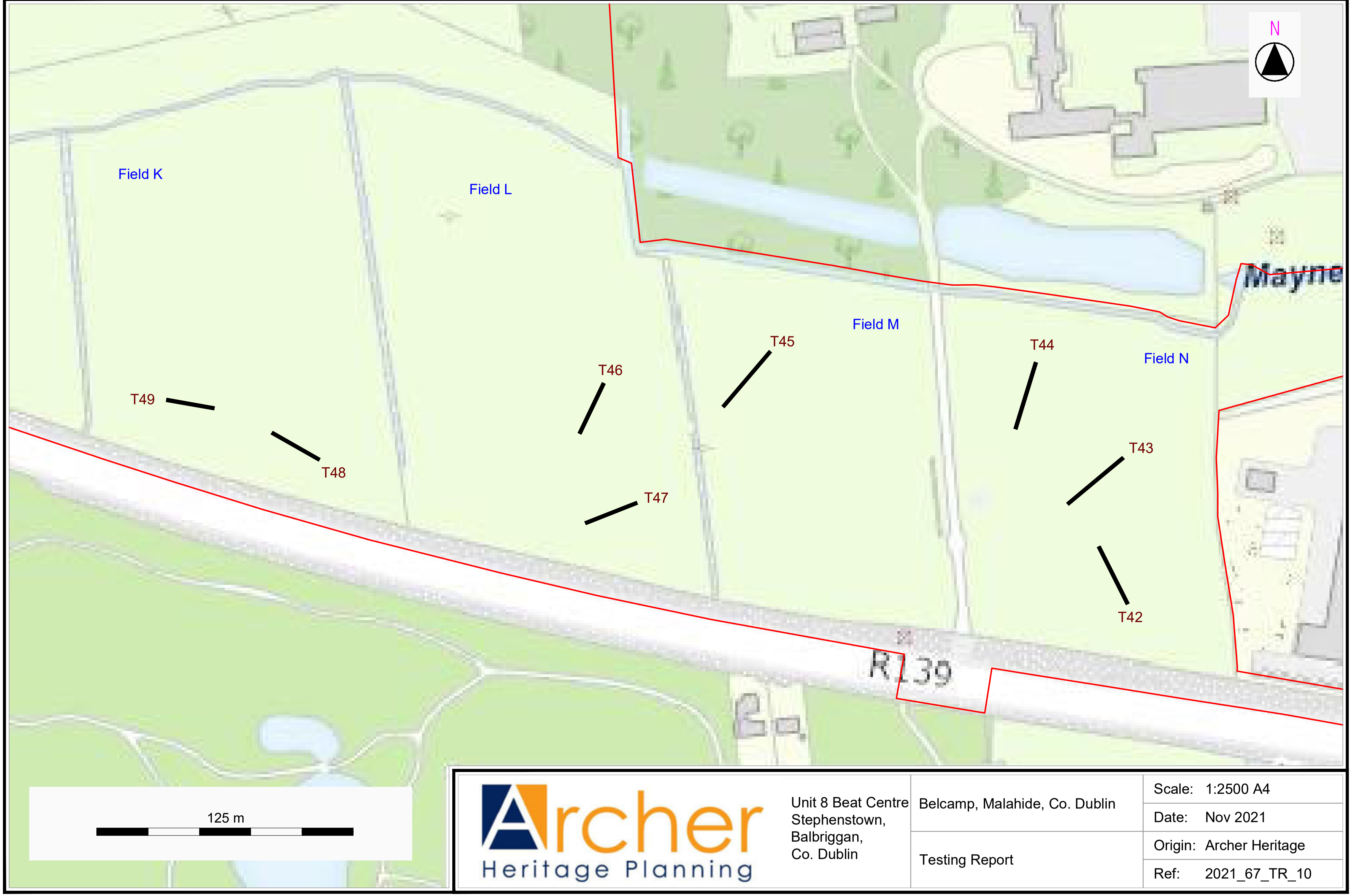
Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Co. Dublin

Testing Report

Scale:	1:2500 A4
Date:	Nov 2021
Origin:	Archer Heritage
Ref:	2021_67_TR_09

Figure 9: Test Trench Layout (iii)



Archer Heritage Planning

Unit 8 Beat Centre
Stephenstown,
Balbriggan,
Co. Dublin

Belcamp, Malahide, Co. Dublin

Testing Report

Scale:	1:2500 A4
Date:	Nov 2021
Origin:	Archer Heritage
Ref:	2021_67_TR_10

Figure 10: Test Trench Layout (iv)


Plate 1: Trench 1, Facing NE


Plate 2: Trench 4, Facing NW


Plate 3: Trench 10, Facing E


Plate 4: Trench 17, Facing NW

Plate 5: Trench 22, Facing SW, Note plough furrows

Plate 6: Trench 26, Facing N, note plough furrows

Plate 7: Trench 30, Facing E, Note plough furrows

Plate 8: Trench 37, Facing W

Plate 9: Trench 40, Facing W

Plate 10: Trench 44, Facing N

Plate 11: Trench 47, Facing SW

Plate 12: Trench 48, Facing SE, note plough furrow

Plate 13: Trench 50, facing SE

Plate 14: Trench 51, Facing E

Plate 15: Trench 1 & 4 facing W, note curving band of natural

Plate 16: Trench 4, Facing SW, note curving band of natural in fore and background

Plate 17: Trench 1 & 4, detail of curving band of yellow natural

Plate 18: Trench 1 & 4, Test pit through curving band of natural, non-archaeological

Plate 19: Trench 22, possible shallow pit, Dismissed as non-archaeological

Plate 20: Trench 40, possible pit feature, Dismissed as residual topsoil

Plate 21: Trench 50, Red brick spread, note table wear sherds

Plate 22: Trench 51, red brick spread

APPENDIX 13.4: ARCHAEOLOGICAL GEOPHYSICAL SURVEY

Proposed Development,
Belcamp and Clonshagh townlands,
Co. Dublin

Archaeological Geophysical Survey

Detection Licence No. 21R0190

Survey undertaken on behalf of
Gerard Gannon Properties

H. Gimson BA (Hons) MSc MIAI

EARTHSOUND geophysics

EAG 440

17 September 2021

Prospect House, Drumagh, Claremorris, County Mayo, Ireland
earthsound.ie

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Summary of Results

Between the 9th August and the 3rd September 2021, a geophysical survey commissioned by Gerard Gannon Properties was conducted over a series of fields within the townlands of Belcamp and Clonshagh, County Dublin. A magnetometer survey was undertaken at a sample resolution of 0.5m x 0.25m. Significant potential archaeological remains were further investigated using an electromagnetic instrument at a sampling resolution of 0.5 x 0.25 m. The survey was conducted upon a bedrock geology consisting of limestone and shale, beneath tills. The majority of the survey area was covered in newly harvested crop fields with pasture occurring on the southern edge of the site.

Within the southwestern fields large areas of magnetic disturbance were detected, suggestive of soil importation or metallic debris and which may have masked any underlying archaeological remains. The fields to the southeast did however reveal a number of possible arcing ditches, a possible enclosure ditch and a number of possible pits.

Within the centre of the survey area a large double ditched enclosure has been detected alongside a series of possible pits, potential ring-ditches and further possible enclosure ditches. An arcing stone or compact earth feature was also detected which may be archaeological in origin.

The northeastern fields revealed a number of highly magnetic and stone deposits which could be archaeological or structural in origin. In addition a large oval enclosure was detected which is cut by a later townland boundary. This enclosure appears to contain internal features and boundaries.

Within the northwestern portion of the survey area the true extent and composition of recorded monument ring-ditch DU014-128---- has been established. This monument appears to comprise of a slightly oval ditch which is punctuated by pits or deposits and a central pit. The monument may have a conjoining ring-ditch on its northern edge. Within the vicinity a number of other possible ring-ditches were detected along with an oval enclosure with internal pits.

Further areas of possible pits, enclosures and possible ring ditches were detected through the northwestern portion of the survey area. Of particular note is a potential double ring-ditch on the northern field boundary and a large enclosure containing possible pits.

In addition to the possible archaeological remains detected, a large number of relict field boundaries have also been identified (both previously recorded on historic maps and unrecorded). This suggests that the landscape has been intensively cultivated over a long period. When these field boundaries are combined with the evidence of cultivation furrows it becomes apparent that any archaeological remains may have been heavily impacted by agriculture processes.

Statement of Indemnity

A geophysical survey is a scientific procedure that produces observations of results which are influenced by specific variables. The results and subsequent interpretation of the geophysical survey presented here should not be treated as an absolute representation of the underlying archaeological features, but as a hypothesis that must be proved or disproved. **Direct investigations are recommended to confirm the findings of this report.** Verification can only be provided via intrusive means, such as Test Trench excavations.

1 Introduction

Earthsound Geophysics Ltd. was commissioned Gerard Gannon Properties to execute a geophysical survey over numerous fields within the townland of Belcamp and Clonshagh, County Dublin.

The geophysical survey was requested to determine the presence/absence of unknown archaeological features as well as any features associated with Ring-ditch DU014-128---- which is located within the proposed development.

The site was assessed using Magnetometer surveys across all fields. Areas of interest were then further investigated using targeted electromagnetic surveys.

The method was approved by the Archaeological Licensing Section of the National Monuments Service. A Consent to use a Detection Device under Section 2 (2) of the National Monuments (Amendment) Act, 1987, was issued by the Minister for Housing, Local Government and Heritage: Consent No. 21R0190, issued to Heather Gimson. In accordance with the licence conditions a copy of this report will be lodged with the department.

1.1 Geography, Geology, Topography & Climate

Townland	Belcamp and Clonshagh
County	Dublin
Central ITM Co-ordinates of the site	720204, 741440
No. of Fields Surveyed	15
Ground Cover per Field	Undulating to sloping ground which contained pasture and newly harvested wheat and beans.
Geology	Limestones and shale (GSI 2019)
Drift / Quaternary Geology	Till with limited areas of alluvial deposits around the waterway which cuts the site (GSI 2019)
Soils	Till (GSI 2019)
Drainage	Dry (GSI 2019)
Expected effect of Soils/Geology	Potential archaeological remains may contain poor magnetic contrast. The use of targeted electromagnetic surveys is aimed to mitigate against this and enable more definition to be gained for potential archaeological features.
Climate	The majority of the weather encountered during the survey was dry and sunny with limited rain fall. It is not anticipated that the weather conditions will impact the surveys undertaken.

1.2 Archaeological Background

The survey area encompasses 15 agricultural fields which are bounded to the south by the R139. The Mayne River divides the area which is centred around the Belcamp Hall subsequently used as Belcamp College. This building is registered on the National Inventory of Architectural Heritage (11350024) and was once surrounded by a formal garden design including chapel, walled garden, ball court, icehouse and formal water features.

Contained within the survey area recorded monument Ring-ditch DU014-128---- has been identified from aerial imagery. A further Ring-ditch DU015-033---- is located on the southwestern edge of the survey area, however this area couldn't be surveyed due to the presence of construction activity. Ring-ditch DU015-033---- however had been subject to a previous geophysical survey undertaken by Leigh in 2016 (information taken from the Archaeological and Cultural Heritage chapter of the Belcamp EIS supplied by Courtney Deery Heritage Consultancy Ltd).

1.3 Aims & Objectives

The aim of the geophysical survey was to determine the nature of the archaeological resource in advance of the proposed development scheme. Specific objectives were to:

- Determine the presence or absence of archaeological features
- Assess the spatial extent of the archaeological features
- Assess the extent of Ring-ditch DU014-128----

A detailed magnetometer survey was undertaken followed by targeted electromagnetic surveys. These techniques have been used in commercial and research archaeological projects for many years and are considered the most appropriate techniques for a detailed investigation of the underlying archaeology (Aspinall *et al*. 2008, Clark 1996, Scollar *et al.* 1990, Gaffney & Gater 2003).

Where possible, the use of multiple geophysical techniques allows a greater confidence to be placed in the interpretation of detected anomalies, which is especially useful on small sites such as this. Their combined application can be used to determine the geometry, compositional material and the extent of an archaeological target.

2 Methodology

Fieldwork Dates	09/08/2021 – 03/09/2021
Survey Area	63 Ha
Method / Area	Magnetometer: 63 Ha Electromagnetic Apparent Electrical Resistivity (ER_a): 6.3 Ha

2.1 Magnetometer Survey

Instrument	Eastern Atlas LEA MAX^{1505} System
Components	LEA D2, 10-channel digitiser
Data Acquisition Resolution	0.5m x 0.1m
Sensors	8 x Förster FEREX® 4.032 CON650 fluxgate gradiometers
Platform	LEA MAX^{1505} System cart
Data Acquisition Method	Gridless, using a Trimble RTK GPS VRS Now system to an accuracy of 5cm
Sensitivity	<0.2 nT
Data Logger	Panasonic Toughbook CF-H2 Field computer
Calibration	According to manufacturers guidelines (Pilz & Goossens 2015)
Data Processing	Ealdec: Profile decoding Ealmat.m: Normalisation, drift correction Process-it: Surfer 8: Data Gridding (0.5m x 0.25m), using the Kriging Gridding Method
Graphical Display	Greyscale -2nT (white) to 2nT (black)

2.2 Electromagnetic Induction Survey

EMI Measurement	Apparent Electrical Resistivity (ER_a)
Instrument	GF Instruments CMD-MiniExplorer
Data Acquisition Resolution	0.5m x 0.2s
Coil Configuration	Vertical Coplanar Coil configuration (VPC) or ‘half-depth’, effective depth range: 0.25m, 0.5m, 0.9m
Platform	SparrowHawk-1000 cart system
Data Acquisition Method	Continuous mode, Gridless, using a Trimble RTK GPS VRS Now system to an accuracy of 5cm
Measuring Range	ER_a: 1000mS/m, resolution 0.1mS/m
Data Logger	CMD Control Unit
Calibration	According to manufacturers guidelines (GF Instruments 2010)
Data Processing	CMD Data Transfer: conversion to Apparent Electrical Resistivity (ER_a) from Apparent Electrical Conductivity (Quadrature) Process-it: Drift correction using a moving filter, Despike, Low Pass Gaussian Filter, Interpolation
Graphical Display	Greyscale -6 mS/m (black) to 6 mS/m (white)

2.3 Reporting, Mapping & Archiving

The geophysical survey and report follow the recommendations outlined by relevant best practice guidance documents as a minimum standard (David *et al*. 2008; Gaffney *et al*. 2002, Schmidt *et al*. 2015).

Ordnance Survey of Ireland mapping was supplied by Gerard Gannon Properties.

Geophysical data, the figures presented here and the text have been archived following the recommendations of the Archaeology Data Service (Schmidt & Ernenwein 2011).

3 Results & Discussion

The interpretation figures should not be looked at in isolation but in conjunction with the information below and classification terms contained in the Appendices.

Significant Anomalies *are highlighted in Figures 4 & 6 and are described within the text.*

Number classification for geophysical anomalies

M1	*Magnetometer anomalies*
E1	*Electromagnetic Apparent Electrical Resistivity (EMI) anomalies*

3.1 Magnetometer Survey

Figure 3 – Magnetometer Data

Figure 4 – Magnetometer Interpretation

In magnetic data, a dipolar anomaly or ‘iron spike’ is a response to buried ferrous objects, often in the topsoil. Iron spikes generally are not removed in geophysical data, although often modern in origin, they can be indicative of archaeological material. A large amount of ferrous material was detected within the survey area, especially within the southern portion of the survey area. This ferrous is likely to be associated with imported soil, construction debris or works associated with the two pipes which traverse the area.

Field A

This recently harvested flat arable field contains two interconnecting N-S and E-W ditches (**M1**) which correspond to relic field boundaries marked on the first edition historic OS map. **M2** refers to two interconnecting ditches which are likely to relate to relict field boundaries or field divisions which are not contemporary with M1.

Anomaly **M3** is a curving possible cut feature or area of burning, measuring up to 7.6m in diameter. This anomaly could be archaeological or agricultural in origin. **M4** is a band of magnetic interference caused by the overhead power line.

A number of other linear and curvilinear magnetic ditches or cut features were detected across the field. These may relate to archaeological or agricultural activity.

Several linear and curvilinear magnetic trends are also located which could be associated with agricultural, archaeological or geological processes.

Field B

This newly harvested very large flat arable field contains a series of relict field boundaries (**M5**) which are marked on historic OS maps. Comprising of nine ditches or boundary features they form a series of smaller fields which interlink with M1 in the adjacent field.

A series of linear and curvilinear magnetic ditches were detected throughout the survey area which match the orientation of the relict field boundaries. It is likely that these features represent internal subdivision or field divisions within the overall field boundary system. The presence of a number of closely spaced ditches in the northwestern portion of the field could indicate that the land was once divided into strip lynchets or similar divisions.

M6 refers to two sub-circular enclosing features measuring between 14.5m and 17.7m in diameter. These potential archaeological features contain a number of curving ditches or cut features which could suggest internal divisions or structures.

Anomaly **M7** is a sub-circular probable enclosure ditch, measuring c. 30m in diameter with a possible entrance at north. A number of possible pits appear to dissect the ditch while a series of further pits were detected within its interior, indicating the presence of further archaeological material.

M8 is a circular ditch or cut feature which contains a possible break to the northeast and has a diameter of 9m. This feature could relate to an archaeological ring-ditch. A number of similar features were detected across the central and eastern portion of the field. These are likely to have similar origins, although agricultural or geological processes can also not be ruled out.

M9 refers to a cluster of possible pits near the centre of the field. These may be of agricultural or archaeological origin and their presence could indicate the location of an archaeological feature. Two further large possible pits are located to the southeast which could also be of archaeological or agricultural origin.

Anomaly **M10** consists of a U-shaped possible ditched feature which surrounds a small cluster of possible pits and an arcing cut feature. Measuring 30m by 20m this feature is likely to be archaeological in origin. An area of possible burning or soil disturbance, measuring c. 8m in diameter, is located along the southern edge of M10 and is likely to be associated.

Anomaly **M11** is a negatively magnetic sub-circular feature, measuring c. 11m in diameter with a break at the east. This stone or compact earth feature may relate to archaeological remains such as a stone filled ditch or enclosure bank.

M12 is a sub-circular ditch, measuring c. 10m in diameter which contains a number of possible pits or postholes. M12 matches the location of ring-ditch DU014-128----, visible as a crop mark on satellite images. The geophysical survey has confirmed the presence of the monument and indicates that it is punctuated by a series of possible pits or post-holes.

Within the vicinity of M12 a series of other arcing or circular ditches were detected which may relate to archaeological activity.

Numerous linear and curvilinear ditches and magnetic trends were located throughout the field. These could relate archaeological, agricultural or geological activity. The presence of numerous linear ditches on different alignments could indicate the presence of multiple field boundary systems.

Field C

This slightly undulating newly harvested arable field contains two sections of former townland boundaries (**M13**) which are marked on historic OS maps. A central area of magnetic modern disturbance is likely to be associated with their destruction or infilling.

M14 refers to a number of curvilinear possible ditches which potentially form a circular enclosure, c.38m in diameter. This feature is likely to be archaeological and has been cut by the later townland boundary M13.

M15 refers to two linear ditches which cross the southern portion of the larger survey area. These features are likely to relate to relict field boundaries.

Two further curvilinear possible ditches were detected as well as a number of magnetic trends throughout the field. These could relate to archaeological, agricultural or geological features. Cultivation furrows are running through the field in N-S direction.

Field D

This slightly undulating pasture field contained some overgrown areas with young trees and shrubs and a historic well near the centre, all of which limited the area that could be surveyed.

M16 consists of two arcing possible ditches which could be archaeological in origin and may enclose an area c.31m in diameter.

M17 corresponds to relic field boundaries marked on historic OS maps. These form a series of field divisions which lead to or passes through the well and therefore may be related. A pipe was detected leading from this well.

M18 refers to a number of amorphous highly magnetic anomalies near the S field boundary. These may be cut features containing ferrous materials, areas of burning or potentially demolished structural remains, their archaeological significance is unknown.

A number of linear and curvilinear possible ditches or cut features were also located throughout the field. The majority of these are likely to relate to relict field divisions or boundaries. A number of magnetic trends were also detected which could relate to archaeological, agricultural or geological activity. Evidence for cultivation can also be seen with the detection of a series of cultivation furrows.

Field E

This undulating arable field contains a slight S-facing slope and had recently been harvested. The field appears to have once been divided by a series of linear and interconnecting ditches which would have formed a series of small N-S field systems. The orientation of these field systems matches that of the extant eastern field boundary and the cultivation furrows detected.

Anomaly **M19** consists of a large semi-circular ditch, 123m in length which is likely to be archaeological in origin. Contained within the confines of this ditch is a smaller sub-oval enclosure ditch, measuring c. 26m E-W and 27.5m N-S. This feature contains a possible break to the north and is surrounded by several possible pits or postholes.

The presence of these two features indicates that a substantial archaeological double ditched monument may be present, comprising an internal enclosure and larger outer enclosure ditch. Having a total diameter of c.65m this feature may be associated with the curving ditch detected on its northeastern edge and is likely to have been heavily impacted by later field divisions and cultivation processes.

M20 refers to two curvilinear ditches or cut features which were detected on the western edge of the field. Running parallel and with a separation of 18m these features could be archaeological in origin, possibly representing an entranceway which may be associated with anomaly M19.

Anomaly **M21** comprises a small arcing ditch, 18m in length which contains and is surrounded by a number of possible pits or postholes. This potential archaeological ring-ditch, 9m in diameter may be associated with M19. Two further arcing ditches were detected to the north which could also have similar origins.

A number of magnetic trends were also detected within the field. These ditches or cut features could be archaeological or agricultural in origin.

Field F

This newly harvested mostly flat arable field contains numerous linear ditches which divide the field in an E-W direction. It is likely that these features represent former field divisions or possible cultivation furrows.

M22 is an oval ditch, 18m in length and with a diameter of 6m which contains a possible break or entranceway to the northeast. This feature could be archaeological in origin and may be associated with the larger arcing ditch to the northeast which could surround it. Two further arcing ditches were detected within the field which could also have similar origins.

A number of magnetic trends were detected which may be ditches of archaeological or agricultural origin. Cultivation furrows have also been identified which match the orientation of the extant field boundaries.

Field G

This newly harvested slightly undulating arable field contains a series of linear and interconnecting ditches. The orientation of these match the extant field boundaries and they are likely to represent former field sub-divisions. The cultivation furrows detected within the field match the orientation of some of these boundaries.

Anomaly **M23** is a negatively magnetic sub-circular feature, measuring c. 10m N-S and 14.5m E-W with a possible entrance at W. Consisting of compact earth or stone this feature could represent an archaeological stone filled ditch or enclosure bank.

M24 consists of a sub-circular possible ditched feature, 31m in length and 12m in diameter which could be archaeological in origin. This ring-ditch may be surrounded by an arcing ditch to the north. Within the vicinity of M24 two other arcing ditches were detected which could also be archaeological in origin.

M25 is an arcing possible ditch or cut feature, 23m in length which may be archaeological in origin.

Field H

This undulating arable field contains a moderate S-facing slope within its southern portion and is bounded by a thick boundary of trees to the south. Numerous linear ditches or cut features were detected within this field. These all have the same rough alignment and are likely to represent relict field divisions and subdivisions. Indeed a right-angled boundary was detected within the centre of them which represents a field boundary which must predate the historic mapping.

M26 represents a small right-angled ditch detected on the northwest corner of the field. The alignment of this feature slightly differs from the other ditches detected and while it could be part of the same relict field system it may represent an unrelated agricultural boundary or archaeological division.

Two magnetic trends were also detected which may be ditches or cut features of archaeological, geological or agricultural origin.

Field I

This undulating arable field contains a moderate S-facing slope within its southern portion and is bounded by a thick boundary of trees to the south. A series of interconnecting linear and curvilinear ditches were detected across the field. These match the boundaries identified in fields G and H and are likely to be agricultural in origin.

Anomaly **M27** refers to two curvilinear ditches forming a sub-circular possible enclosing feature. This possible archaeological enclosure has a diameter of c. 19m and may be associated with an arcing ditch to the southeast. A possible ditch extends from M27 to the southeast.

M28 consists of a curvilinear ditch which crosses the relict field boundaries. The orientation of this ditch does not match that of any surrounding features suggesting that it could be archaeological, agricultural or geological in origin.

A series of magnetic trends were also detected which may be ditches or cut features of archaeological, geological or agricultural origin.

Field J

This undulating pasture field contains many overgrown areas which could not be surveyed. The majority of the field is covered in high magnetic responses and dipolar anomalies which indicate a high level of modern disturbance and soil importation or dumping of ferrous materials. The presence of this material may mask any underlying archaeological remains.

Also detected was a large services pipe runs across the N section of the field in E-W direction and a smaller pipe runs parallel to the S field boundary. The presence of these pipes will have contributed to the highly magnetic responses detected within the field.

Four segments of possible ditch were however detected which may be archaeological or modern in origin.

Field K

This arable field contains a gentle N-facing slope along the N section. The field is dissected by two service pipes and contains a large amount of high magnetic responses and dipolar anomalies which are likely to be from similar sources to those in field J. The presence of this material may mask any underlying archaeological remains.

The field contains a series of linear ditches or cut features which could be archaeological in origin but are more likely to be agricultural. **M29** is a relic field boundary ditch marked on historic OS maps.

Anomaly **M30** refers to two highly magnetic isolated anomalies which contain an unusual magnetic signature. While these could be associated with archaeological material they could also relate to some type of metal alloy of unknown origin perhaps modern in origin.

Field L

This arable field contains a gentle N-facing slope along the N section and is dissected by two service pipes. Zones of high magnetic responses and dipolar anomalies were also detected which are likely to be from similar sources to those in fields J and K. The presence of this material may mask any underlying archaeological remains.

A number of linear and curvilinear possible ditches or cut features were detected across the field. These could be archaeological or agricultural in origin. A series of magnetic trends were also detected which are likely to have similar origins.

M31 is a band of magnetic interference caused by the overhead power line.

Anomalies **M32** and **M33** refer to highly magnetic isolated anomalies which contain unusual magnetic signatures. While these could be associated with archaeological material they are likely to have similar origins to M30 and could also relate to some type of metal alloy of unknown origin.

Cultivation furrows have also been identified which match the orientation of the extant field boundaries.

Field M

This arable field contains a slight N-facing slope. Two service pipes dissect the field along with a band of magnetic interference caused by the overhead power line (M31). Anomaly **M34** comprises an arcing ditch or cut feature, 18m in length which contains a number of possible pits, postholes or deposits. This anomaly could represent an archaeological feature.

M35 consists of two arcing possible ditches or cut features, measuring 14m and 16m in length these anomalies could be archaeological, agricultural or geological in origin.

A series of curvilinear possible ditches were also detected across the northern half of the field. These could be archaeological, agricultural or geological in origin. Of partial interest is **M36**, which consists of two parallel ditches, 20m in separation which may represent the remains of an entranceway or trackway leading to Belcamp house.

Cultivation furrows have also been identified which match the orientation of the extant field boundaries.

Field N

This arable field contains a slight N-facing slope which is dissected by two service pipes.

Anomaly **M37** is an isolated very highly magnetic response caused by a large ferrous object or borehole. Alternatively the anomaly could have similar origins to M30, M32 and M33.

M38 refers to a number of isolated possible pits located in the southern half of the field. These pits could be archaeological, agricultural or modern in origin.

A number of linear and curving ditches as well as magnetic trends were also detected within the field. These could relate to archaeological, agricultural or geological activity. Cultivation furrows have also been identified which match the orientation of the extant field boundaries.

Field O

No survey could be undertaken in this field due to it being heavily overgrown.

3.2 Electromagnetic Apparent Electrical Resistivity Survey

Figure 5 – Electromagnetic Apparent Electrical Resistivity Data

Figure 6 – Electromagnetic Apparent Electrical Resistivity Interpretation

Field A

A linear low resistivity anomaly **E1** runs through the centre of the field in E-W direction. This coincides with a ditch in the magnetometer data (M3) and a former field boundary marked on historic OS maps. Three further linear possible ditches are locates to the south of E1 and are likely to be related agricultural boundaries.

E2 represents five isolated areas of low resistivity located throughout the survey area. These could be pits or post holes of archaeological origin or be associated with agricultural or geological soil disturbance. The eastern most anomaly coincides with magnetometer anomaly M2.

E3 refers to five sub-circular low resistivity anomalies detected through the centre of the survey area. Measuring between 8m and 13m in diameter these cut features could represent archaeology.

E4 consists of three curvilinear and one linear high resistivity anomalies. These compact earth or stone features may relate to geological or agricultural processes or archaeological remains.

Evidence for ploughing was also identified through the detection of a number of cultivation furrows.

Field B

Western Survey Area:

E5 is a broad high resistivity and a parallel low resistivity anomaly which runs parallel to the W field boundary. These features could represent a relict bank and ditch field boundary, farm track and ditch or possibly an archaeological bank and ditch system.

E6 refers to two curvilinear and two linear low resistivity ditches or cut features. Measuring between 26m and 46m in length these could represent agricultural or archaeological features. The larger of the two curvilinear anomalies partially coincides with magnetometer anomaly M7 and may be a section of an enclosure ditch.

Northern Survey Area:

E7 represents a number of interlinking linear high resistivity anomalies which cross the survey area. Consisting of compact earth or stone these features could be associated with relict field walls or banks, land drains or stone filled ditches.

Anomaly **E8** refers to two sub-circular possible cut features, c.8m in diameter. These features could be archaeological and may be associated with M6 which is located very close to them. A further arcing ditch was detected to the north of E8 which may also be related.

E9 corresponds to a number of isolated low resistivity possible pits which could be archaeological or agricultural in origin.

E10 is a wide curvilinear low resistivity possible ditch, measuring between 4.5m and 8.5m in width and 46m in length. This feature could be associated with a relict agricultural boundary, archaeological feature or potentially the movement of modern machinery in the field.

Two further linear low resistivity anomalies were detected which appear to possibly interlink with E7 and are likely to be agricultural ditches.

Eastern Survey Area:

E11 consists of a sub-oval low resistivity ditch which is likely to be archaeological in origin. Measuring 28m in diameter this enclosure matches M10. The southern edge of this feature appears to contain two interconnecting ditches or has been recut and extended. The space between these two ditches is occupied by a cut feature detected in the magnetometer data. Contained within the centre of E11 is a possible ring-ditch, 6.6m in diameter which is truncated by four possible pits. This feature does not match the location of the arcing ditch detected in the magnetometer data indicating that there may be multiple internal features present within the enclosure.

E12 is a semi-circular low resistivity ditch which was detected on the edge of the survey area. Measuring 7m in diameter this feature could be archaeological in origin and may be associated with E11. Two linear ditches are located within the vicinity of the anomaly, these are likely to be agricultural.

Anomal**y E13** comprises a sub-circular high resistivity compact earth or stone feature, 14m in diameter which contains three possible pits and an associated arcing ditch, 11m in length. These features are likely to be archaeological in origin and have been truncated to the north by an agricultural ditch.

E14 represents two arcing ditches, 29m and 19m in length which may be part of the same feature. These anomalies could be archaeological, agricultural or geological in origin.

Surrounding E14 a number of linear and curvilinear low resistivity ditches were detected. These are likely to be agricultural in origin and appear to form an interconnecting series of former field divisions. A series of curvilinear high resistivity compact earth or stone features were also detected which are likely to be agricultural or geological in nature.

E15 refers to an arcing high resistivity anomaly, 19m in length. This feature could be archaeological, agricultural or geological in origin. To the south an isolated possible pit was detected which may be related.

E16 is an oval low resistivity ditch or cut feature, 24m by 21m. A second arcing ditch was detected to the northeast which may be associated. It is likely that E16 represents an archaeological enclosure which interlinks to a series of agricultural boundaries to the south.

E17 consists of six possible pits which were detected to the north of E16. These pits could be agricultural or geological in origin but given their proximity to E16 an archaeological explanation is more likely.

E18 refers to a large area of low resistivity. Measuring 8m in diameter this feature could be archaeological, agricultural or geological in origin.

Anomaly **E19** comprises of an arcing high resistivity compact earth or stone feature, 16m in length which appears to surround an internal oval division. This division also comprises of compact earth or stone and measures 6m in width. These features could be archaeological or geological in origin and may be associated with the two possible pits which were detected within them.

E20 is a small section of arcing ditch, 11m in length which matches the northeastern edge of recorded monument ring-ditch DU014-128---- (also detected in magnetometer data M12). One possible internal pit was detected within this feature.

E21 is an arcing low resistivity ditch which is located on the northeastern edge of E20. Measuring 12m in length and surrounding four possible pits, this feature is likely to represent a conjoining ring-ditch on the northeastern side of recorded monument DU014-128----.

Within the vicinity of E19, E20 and E21 a series of linear and curvilinear low resistivity ditches were detected. While some of these could be archaeological in origin, the majority appear to form relict agricultural boundaries. This suggests that the area has been heavily impacted by agricultural processes, which may have also affected the preservation of the archaeological remains.

Field C

Anomaly **E22** is a sub-circular high resistivity anomaly which is a possible compact earth enclosing feature such as a bank. It measures c. 46m in diameter and represents archaeological remains. E23 coincides with magnetometer anomaly M14.

The remains of relict field and townland boundary can be seen truncating the enclosure. This boundary is marked on historic OS maps and was detected in the magnetometer data anomaly M13.

E23 is an arcing low resistivity ditch which was detected in the northwestern portion of the survey area. 23m in length, the location and orientation of this anomaly could indicate that it possibly represents a ditch surrounding E22.

E24 refers to a number of features which are located within the confines of enclosure E22. Two large possible pits or cut features, 8m and 7m in length were identified as well as a sub-circular ditch, 31m in length and 10m in diameter. The presence of these anomalies suggests that enclosure E22 contains internal features.

Anomaly **E25** consists of a rectangular low resistivity feature measuring 22m by 13m. This dug or disturbed ground feature may be associated with a relict field boundary, destruction of enclosure E22 or may represent later structural remains.

A series of linear and curvilinear high resistivity anomalies were detected within the survey area. These compact earth or stone features may represent archaeological, agricultural or geological processes.

Field D

Anomaly **E26** comprises of a wide low resistivity anomaly which runs parallel to a wide high resistivity anomaly to the southwest. Measuring c. 15m by 5m in width these anomalies could be associated with agricultural processes such as a ditch and bank, represent an entranceway or could be geological in origin.

Surrounding E26 a series of low resistivity ditches were detected. The majority of these are likely to be agricultural in origin, while the two curvilinear features could represent archaeological or geological remains.

E27 refers to two zones of high resistivity. Measuring 13m and 8m in width these compact earth or stone remains could be structural in origin or associated with soil deposition or geological activity. They occur within the vicinity of M18 which are anomalous features in the magnetometer data indicating that the area contains multiple features of unknown origin.

Surrounding E27 numerous linear and curvilinear possible ditches were detected which are likely to be associated with agricultural processes, although an archaeological explanation cannot be totally ruled out.

Field E

E28 consists of four possible pits or post-holes and a small arcing low resistivity ditch, 25m in length. This ditch matches the location of a small arcing ditch detected in the magnetometer data between M20. E28 could be archaeological or agricultural in origin.

E29 represents a large zone of high resistivity compact earth or stone, 24m by 12m. This feature could be archaeological, agricultural or geological in origin. To the south two possible pits were detected which may be related.

Anomaly **E30** comprises two curvilinear high resistivity features which could represent the same compact earth or stone feature. These anomalies match the location and orientation of the largest ditch within M19. It is likely that the magnetometer detected the external ditch which encompasses bank E30.

E31 consists of an arcing low resistivity ditch which was detected leading from the southeastern corner of the survey area. Measuring 110m in length and containing a possible extension to the northwest, this feature could be archaeological in origin. A possible pit is located near its centre. The fact that E31 overcuts E30 means that the two features cannot be contemporary.

E32 refers to two sub-oval low resistivity anomalies which were detected to the north of E31. Measuring 50m and 39m in length these anomalies could be geological in origin or may represent archaeological processes associated with either E30 or E31.

A curvilinear high resistivity compact earth or stone feature truncates the survey area, terminating at E31. This feature appears to represent a bank associated with a ditch detected in the magnetometer data (northern portion of M20). The features could be archaeological or agricultural in origin.

A series of linear and curvilinear low resistivity ditches were also detected across the survey area, these are likely to be agricultural in origin.

Field G

E33 consists of two isolated high resistivity anomalies which are located in close proximity to each other. These compact earth or stone features could represent archaeological or geological remains. The northern feature sits within the centre of a small circular ring-ditch detected in magnetometer data M24.

To the north a linear high resistivity compact earth or stone feature was detected which is likely to be agricultural or geological in origin.

E34 comprises of two arcing ditches, 34m and 14m in length which have a separation of 4 m. Between these ditches two possible pits were detected. It is likely that these features represent archaeological remain and they could be associated with the largest arcing ditch which magnetometer anomaly M24.

A series of linear and curvilinear low resistivity ditches or cut features were detected throughout the survey area. These are likely to be agricultural in origin, some matching the orientation of the extant field boundary or anomalies detected in the magnetometer data.

4 Conclusion

4.1 Summary of Results

The geophysical survey undertaken for this report has revealed a large amount of buried anomalies within the survey area. Within the southwestern fields large areas of magnetic disturbance were detected which are suggestive of soil importation or metallic debris. The presence of this material may have masked any underlying archaeological remains. The fields to the southeast did however reveal a number of possible arcing ditches, a possible enclosure ditch and a number of possible pits.

Within the centre of the survey area a large double ditched enclosure has been detected alongside a series of possible pits, potential ring-ditches and further possible enclosure ditches. An arcing stone or compact earth feature was also detected which may be archaeological in origin.

The northeastern fields revealed a number of highly magnetic and stone deposits which could be archaeological or structural in origin. In addition a large oval enclosure was detected which is cut by a later townland boundary. This enclosure appears to contain internal features and boundaries.

Within the northwestern portion of the survey area the true extent and composition of recorded monument ring-ditch DU014-128---- has been established. This monument appears to comprise of a slightly oval ditch which is punctuated by pits or deposits and a central pit. On the northern edge of the monument suggestions of a second conjoining ring-ditch were detected along with associated pits.

Within the vicinity of the record monument a number of other possible ring-ditches and possible enclosure ditches were detected, indicating that the area may be rich in archaeological remains. An oval enclosure was also detected in both techniques used which appears to contain internal pits and at least two possible ring-ditches.

Further areas of possible pits, enclosures and possible ring ditches were detected through the northwestern portion of the survey area. Of particular note is a potential double ring-ditch on the northern field boundary and a large enclosure containing and punctuated by possible pits.

In addition to the possible archaeological remains detected, a large number of relict field boundaries have also been identified (both previously recorded on historic maps and unrecorded). This suggests that the landscape has been intensively cultivated over a long period. When these field boundaries are combined with the evidence of cultivation furrows it becomes apparent that any archaeological remains may have been heavily impacted by agriculture processes.

4.2 Dissemination

The results of this survey were submitted to Gerard Cannon Properties. Additional copies will be distributed in accordance with the Consent to use a Detection Device.

5 Acknowledgements

Report:	Heather Gimson BA (Hons) MSc MIAI
Fieldwork:	Ursula Garner BSc (Hons) MSc Darren Regan BSc MA Cian Hogan BSc (Hons)

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7 Figures

Technical Appendix

Appendix 1: Anomaly Classifications

Magnetometer

Magnetometer surveys are undertaken using magnetic gradiometers which measure the magnetic content of the underlying soils. Measurements are gained using sensors which calculate the difference between the geological / pedological background and anthropogenic remains associated with archaeological activity.

Positive Magnetic Anomalies

Burnt features, particularly kilns, but also hearths, furnaces and burnt (specifically ‘burnt’, not ‘heated’) mounds of stone will create a strongly magnetic anomaly due to thermoremanence. Cut features, such as pits, ditches or wooden postholes will create anomalies that will vary in shape and magnetic intensity depending on which material they were backfilled by (Fassbinder 2015). For cut features backfilled (or ‘refilled’) by

- magnetically enhanced topsoil – the refill will generate a positive magnetic anomaly

- homogeneous topsoil – the refill will generate an anomaly proportional to the size and volume of the archaeological feature.

The magnetic anomaly shape and intensity will also be determined by concentrations of pottery, ash or burned material, solid rocks or other material.

Negative Magnetic Anomalies

Negative magnetic anomalies have a number of causes (Fassbinder 2015):

- The material remains of the archaeological feature may have a lower magnetic susceptibility (MS) than the adjacent topsoil. In some cases the MS of a ditch may appear as both a positive and negative anomaly, reflecting the variable MS of the refill material. Some stone foundations can also appear as weakly magnetic or negative magnetic anomalies.

- If a cut feature is immediately refilled by the same material e.g. a grave cut excavated before a funeral is (almost) immediately refilled by the human body and the same (unaltered) sediment that was excavated before.

- Geochemical processes (see Fassbinder 2015) can alter the magnetic response, e.g. an archaeological feature identified by a positive anomaly can convert to a negative anomaly due to the combination of stagnant moisture and a changing groundwater table.

Dipolar Anomalies

A dipolar anomaly is a response to buried ferrous objects, often in the topsoil. Iron spikes generally are not removed in geophysical data; although often modern in origin (iron agricultural implements, rubbish), they can be indicative of archaeological material.

Absence of Anomalies

It is also possible that archaeological features exist that exhibit no magnetic contrast and hence cannot be identified by magnetometer survey.

Anomaly classification used to interpret Magnetometer data

After Gaffney & Gater (2003) and Gaffney *et al.* (2000).

A known archaeological feature type e.g. Ditch / Wall / Structure etc: An anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil, where the presence of a type of archaeological feature is known from supporting evidence.

Archaeology: A linear, curvilinear or isolated anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil, without any supporting evidence from another source.

- **Ditch / Wall:** A linear, curvilinear, annular or penannular anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil. A positive polarity suggests a ditch; a negative polarity suggests a stone-filled ditch or wall.
- **Burnt Mound / Spread:** A horseshoe or ovoid shaped anomaly with a positive magnetic gradient that contrasts strongly with the surrounding sub-soil. An associated trough may be observed as a positive/negative anomaly, a hearth may also be expected nearby. Isolated responses in the vicinity could represent spreads of (or ploughed out) heat shattered stones.
- **Hearth:** A small isolated area (<2m diameter) of higher magnetic gradient than the surrounding sub-soil (typically >6nT).
- **Pit:** A small isolated area (>1-2m diameter) of moderate to high magnetic gradient, judged to be caused by a pit-type feature with a fill more magnetic than the surrounding soil.

Industrial: An isolated anomaly with a strong positive gradient (>30nT), judged not to be surface iron. This type of anomaly is typically caused by the remains of kilns or furnaces.

Magnetic Enhancement: A broad area of moderate positive magnetic gradient that contrasts with the surrounding sub-soil. May represent cultural noise associated with occupation or soil disturbance, judged to be of archaeological origin.

Ferrous: Dipolar anomalies indicating ferrous responses, judged to be in the near-surface.

Cultivation: Parallel linear responses of positive or negative polarity. Strong responses may indicate added magnetic material (e.g. burnt deposits) as fertiliser. Lower magnetic gradient anomalies ‘beneath’ the furrow overprint may be obscured. Higher magnetic gradient anomalies may be visualised *in situ* or ploughed out ‘beneath’ the furrow overprint.

?Archaeology: A linear, curvilinear or isolated anomaly with a magnetic gradient that contrasts weakly with the surrounding sub-soil, without any supporting evidence from another source. Such categories may represent possible archaeological or geological sources.

Modern Disturbance: Area where the ground has been disturbed in the recent past. Characterised by a high level of noise and very large magnetic gradients, this disturbance is often accompanied by concentrations of dipolar, near-surface ferrous responses. This category also represents anomalies whose source may lie beyond the survey area, such as fencelines, vehicles or modern buildings.

Modern Pipe: Straight, linear anomaly with very large magnetic gradients alternating regularly between positive and negative polarity.

Previous Excavation?: Area of uniform magnetic signal contained within a well-defined boundary in regions otherwise densely covered with archaeological anomalies.

Geology: Anomalies of possible geomorphological origin.

Electromagnetic Apparent Electrical Resistivity

Electromagnetic instruments transmit an alternating current which induces a primary and subsequently a secondary electromagnetic field which interacts with the underlying soils. One of the subsequent responses is the Apparent Electrical Conductivity of the soil, which are subsequently calculated via automated software to Apparent Electrical Resistivity (ER_a).

Anomaly classification used to interpret ER_a data

After Gaffney & Gater (2003) and Gaffney *et al*. (2000).

A known archaeological feature type e.g. Ditch / Wall / Structure etc: An anomaly with a ER_a that contrasts strongly with the surrounding sub-soil, where the presence of a type of archaeological feature is known from supporting evidence.

Archaeology: A linear, curvilinear or isolated anomaly with an ER_a that contrasts strongly with the surrounding sub-soil, without any supporting evidence from another source.

- **Ditch / Wall:** A discrete linear, curvilinear, annular or penannular anomaly with an ER_a that contrasts strongly with the surrounding sub-soil. A low ER_a suggests a ditch; a high ER_a suggests a stone-filled ditch or wall.
- **Mound of Stones:** A discrete horseshoe or ovoid shaped anomaly with a higher ER_a than the surrounding sub-soil.
- **Pit:** A small isolated area (>1-2m diameter) of ER_a that contrasts with the surrounding sub-soil, judged to be caused by a pit-type feature.
- **Cultivation:** Parallel linear responses of high or low ER_a.
- **Disturbed Soil:** A broad area of moderate ER_a change that contrasts with the surrounding sub-soil. May represent cultural noise associated with soil disturbance, judged to be of archaeological origin.

High ER_a Anomalies
Soils comprised of materials of a higher ER_a than the surrounding soil will exhibit anomalies of ‘higher resistivity’. These are likely to include stone walls, masonry, rubble, cobbled or gravel surfaces, as well as near surface geology.

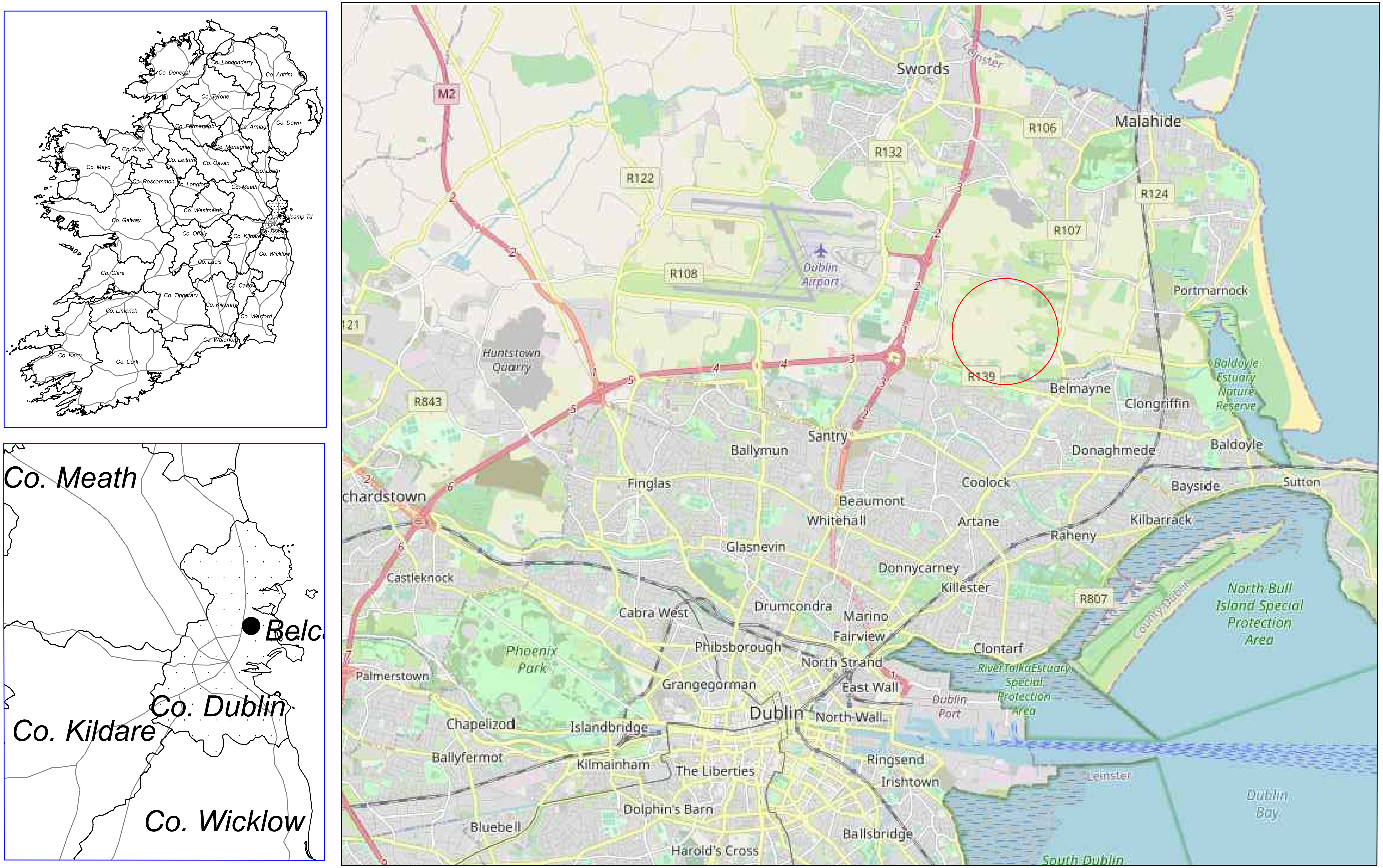
Low ER_a Anomalies
Soils that are comprised of materials of a lower ER_a than the surrounding soil will exhibit anomalies of ‘lower resistivity’. These are likely to include ditches, drainage ditches and pits, as well as palaeochannels, drained soils, a high water table, deep topsoil, springs, boggy areas, areas adjacent to rivers and clay soils.

Modern Disturbance: Area where the ground has been disturbed in the recent past. Characterised by a high level of noise and very large ER_a gradients.

Modern Pipe: Straight, linear anomaly with an ER_a contrast.

Geology: Anomalies of possible geomorphological origin.

Absence of Anomalies
It is also possible that archaeological features exist that exhibit no resistivity contrast and hence cannot be identified by Apparent Electrical Resistivity survey.



Legend

Approximate Site Location

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

Drawing Courtesy of: Open Street Map	Date: 01/09/21	Drawing No.: 21-046/01

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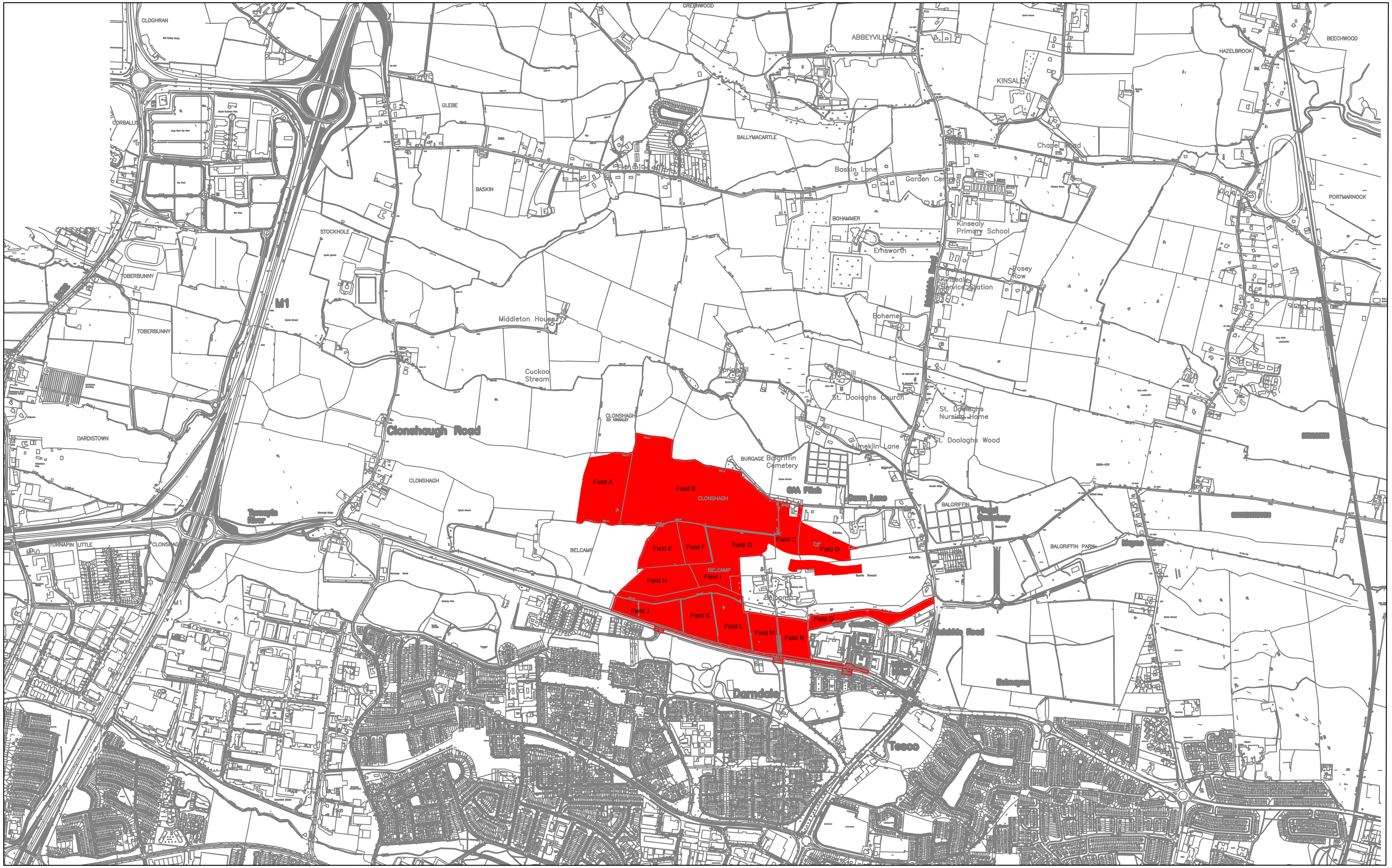
Figure No. 1: Location Map

EARTHSOUND geophysics



Legend

- Basemap
- Geophysical Survey Area

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

Drawing Courtesy of: OSI / Gannon Properties	Date: 01/09/21	Drawing No.: 21-046/02

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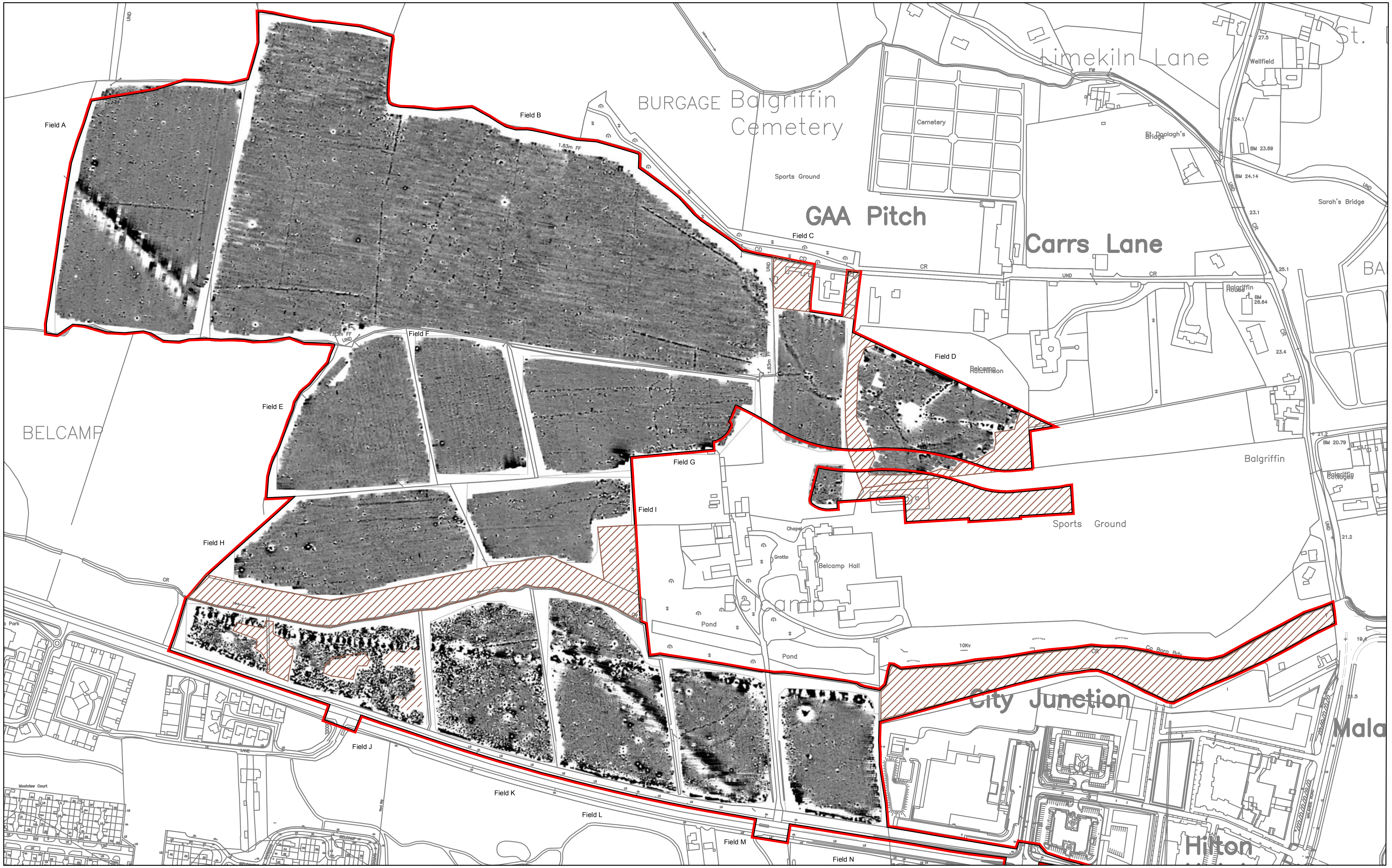
0m 500m 1000m

Figure No. 2: Detailed Location Map

EARTHSOUND geophysics



Legend

— Basemap

— Geophysical Survey Area

nT

-2 0 2

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

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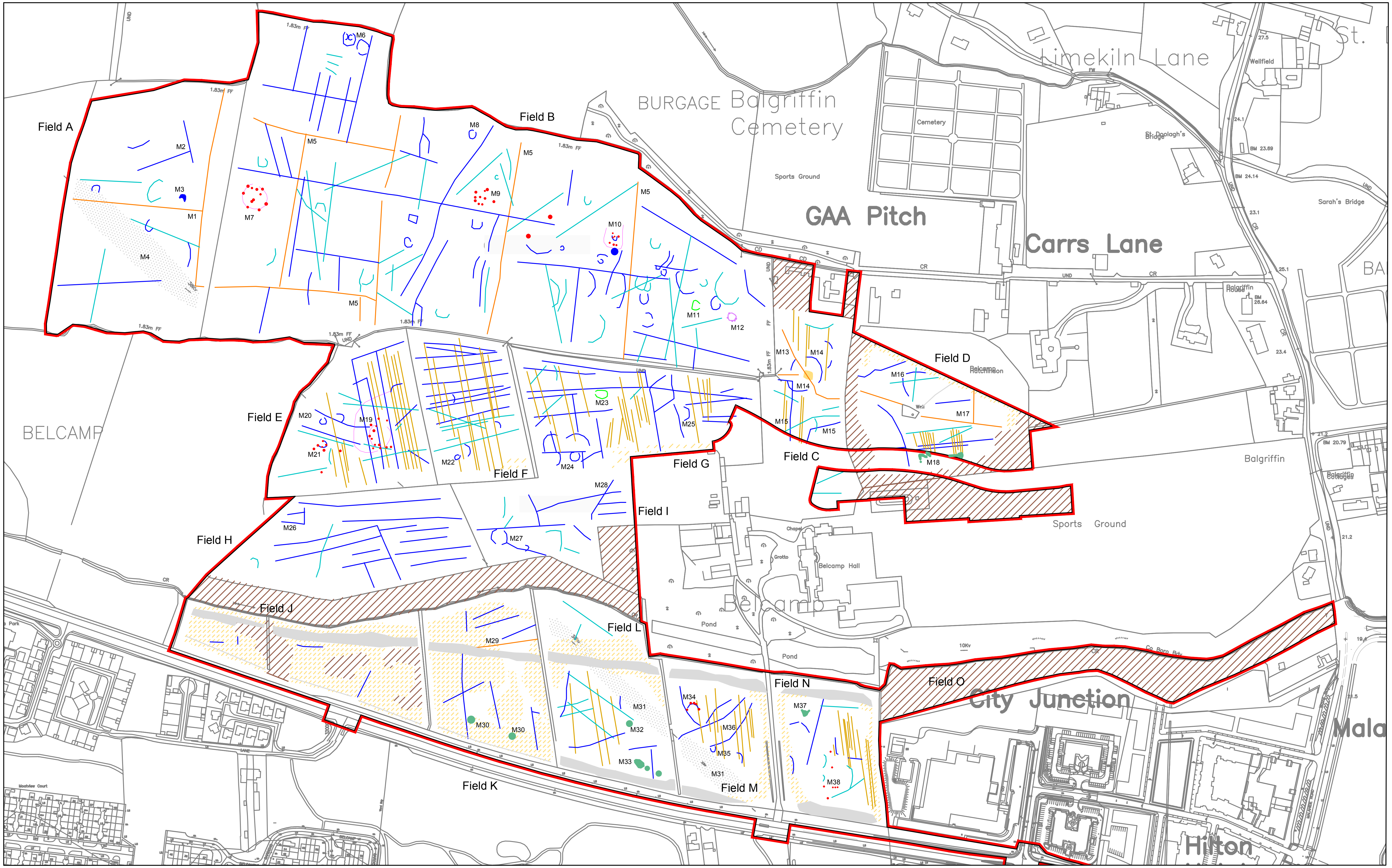
0m 150m 300m

Figure No. 3: Magnetometer Data

EARTHSOUND geophysics



Legend

Basemap	Archaeology	Feature on Historic OS
Geophysical Survey Area	Probable Archaeology	Cultivation
Unsurveyable Area	Possible Archaeology	Modern Disturbance
	Possible Pits	Modern Pipe
	Possible Stone Feature	Overhead Wires Disturbance
	Trend	Highly magnetic Response - Unknown Origin

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

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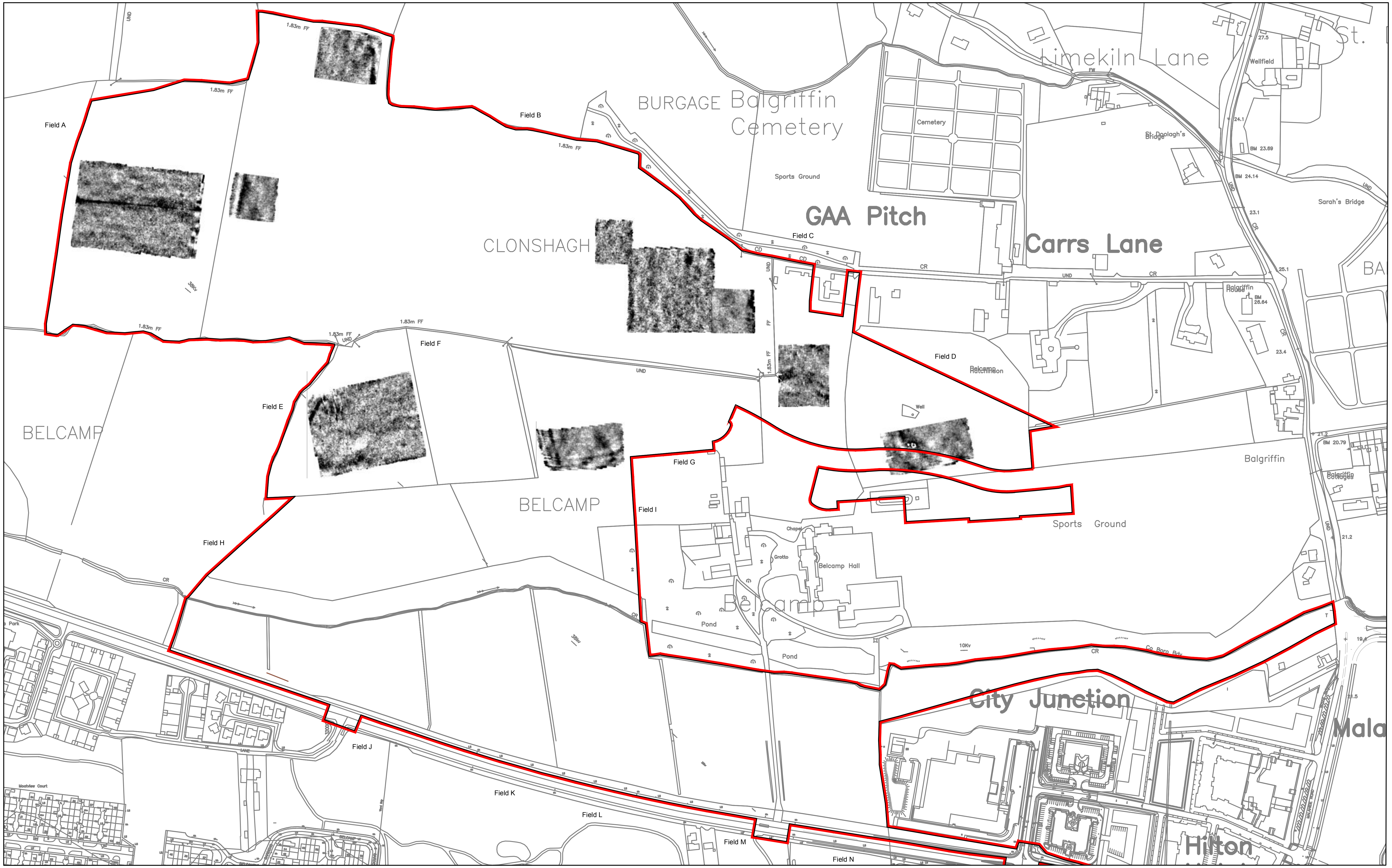
0m 150m 300m

Figure No. 4: Magnetometer Interpretation

EARTHSOUND
geophysics



Legend

— Basemap

— Geophysical Survey Area

mS/m

-6 0 6

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

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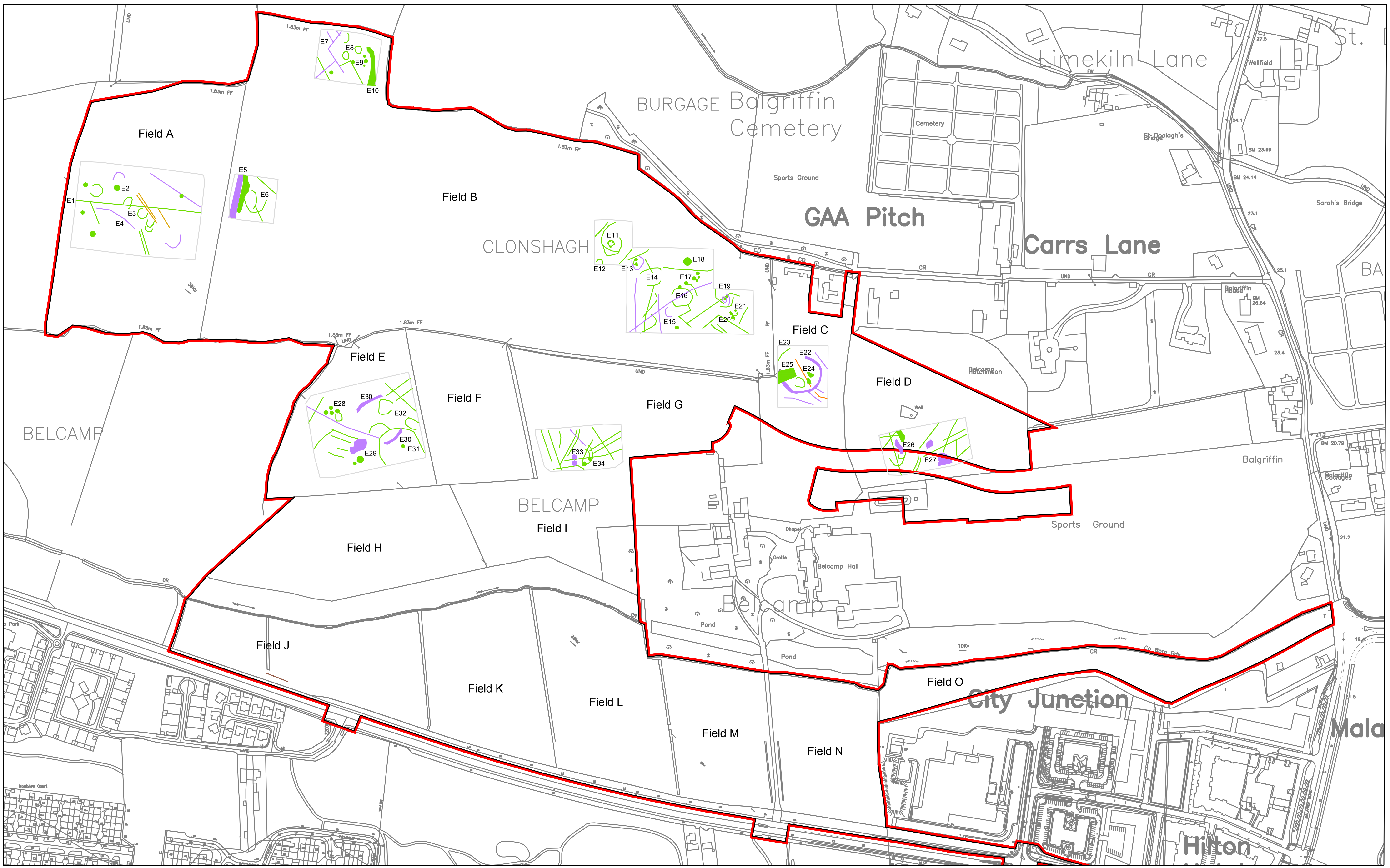
0m 150m 300m

Figure No. 5: Electromagnetic Resistivity Data



Legend

- Basemap
- Geophysical Survey Area
- Resistivity Survey Area

🟩 Low Resistivity Anomaly - Ditch or Cut Feature
🟪 High Resistivity Anomaly - Compact Earth or Stone Feature
🟧 Feature on Historic OS
🟨 Cultivation

Project: Proposed Development, Belcamp, Co. Dublin

Client: Gerard Gannon Properties

Drawing Courtesy of: OSI / Gannon Properties	Date: 16/09/21	Drawing No.: 21-046/06

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0m 150m 300m

Figure No. 6: Resistivity Interpretation

EARTHSOUND geophysics

APPENDIX 14.1: ESB LETTER

Ms.Susan McClafferty,
Gerrard Gannon Properties,
Kinvara House,
52 Northumberland Road,
Dublin 4.

Planning Ref: TBC **Date: 29/03/2022**

Our Ref: ESB-AB-Gannon Homes (Belcamp Strategic Housing Development).

RE: ESB's observation to the proposed development of Gannon Homes (Belcamp Strategic Housing Development).

A Chara,

On behalf of ESB Networks I have reviewed the proposed development at the **Belcamp Strategic Housing Development** Area and based on the drawings received (Drawing No19-114-P4001 Proposed Layout Showing Existing ESBN 38kv Overheads) to this office on the 05/10/2021 also ESB met with the developer Gannon homes and their consultants Waterman & Moylan Consulting Engineers and ESB have the following observations.

- It is important to note that diversions (where possible) can take several months due to factors including alternative route availability, wayleave serving, cable easements, road opening licenses and planning permission requirements.
- On behalf of ESB Networks I can confirm that discussions have taken place with Gannon Homes in respect of the underground of existing *Grange/Collinstown 38KV overhead line* crossing the site.
- I confirm that ESB Networks are working with Gannon Homes to underground the 38kV overhead electrical line that traverses the site. Subject to further design development and agreement between all parties it is technically viable for the existing overhead ESB 38kV Line to be re-routed safely underground through the proposed residential site.
- Further meetings are required between the various concerned parties to consider the ESB *Grange/Collinstown 38KV overhead line* diversions and cable routing options through the wider Belcamp areas and site.
- The ***Collinstown 38KV overhead line*** is vital to the local electrical infrastructure and ESB thinks it important that its presence be taken into account in any development of this site.

- Before starting work it is essential that you have all up-to-date copies of the ESB cable and/or overhead records for all voltages at this location and that these are kept on site at all times while work is proceeding, and understood by all on site. It is important to make contact with this office at the earliest opportunity to ensure they have a clear understanding of the constraints that may apply where conflicts with ESB high voltage networks arise;

Please find attached following documents (with accompanying links) relating to safe working in the vicinity of our networks:

1. Avoidance of Electrical Hazards When Working Near Overhead Lines

<<http://www.esb.ie/esbnetworks/downloads/overhead_lines_electrical_hazards.pdf>>

2. Avoidance of Electrical Hazards when Digging

<<http://www.esb.ie/esbnetworks/downloads/esb_networks_avoidances_of_electrical_hazards_when_digging.pdf>>

3. Trench & Ducting Specifications.

http://www.esb.ie/esbnetworks/en/download_documents/builders_developers/specifications_duct.jsp

If you have any queries on the above please do not hesitate to contact me.

Regards,

Alan Brown.

38kV Design Engineering Officer,

ESB Networks,

HV Construction North,

Kylemore Way, Dublin 8.

Mail to alan.brown@esb.ie, Mobile 0879273970

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