Phases

Controller Stream	Phase	Name	Street minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	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	A	1	1	100
	2	B	1	1	100
	3	C	1	1	100
	4	D	1	1	100
	5	E	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	20, 48, 93, 110, 8	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	23, 51, 74, 97, 125	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

Intergreen Matrix for Controller Stream 1

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

Banned Stage transitions for Controller Stream 1

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

Interstage Matrix for Controller Stream 1

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	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	A	13	20	7	1	7
	2	✓	2	B	25	48	23	1	23
	3	✓	3	C	53	93	40	1	7
	4	✓	4	D	98	110	12	1	7
	5	✓	5	E	115	8	23	1	7

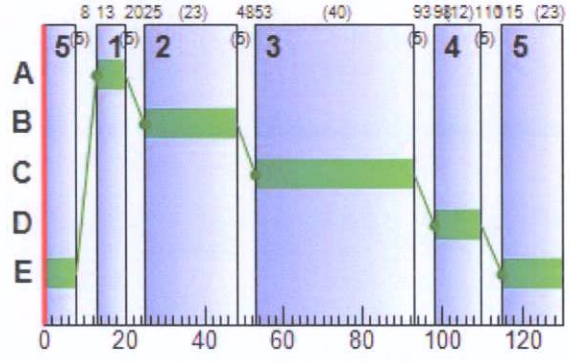
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	13	20	7
	B	1	✓	25	48	23
	C	1	✓	53	93	40
	D	1	✓	98	110	12
	E	1	✓	115	8	23

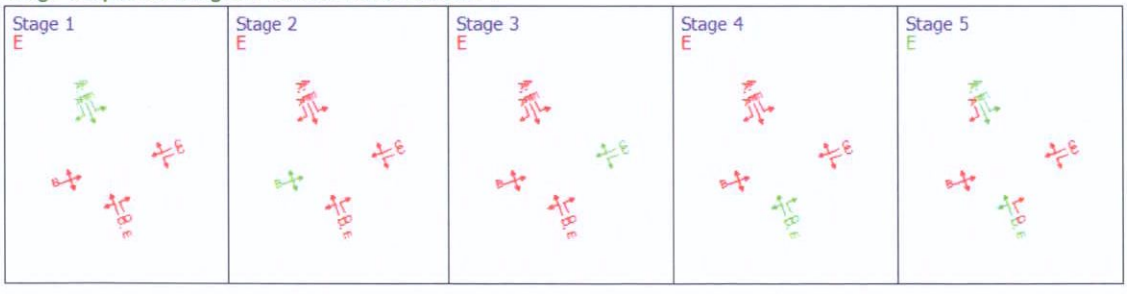
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	53	93	40
A	2	1	1	C	53	93	40
B	1	1	1	D	98	110	12
B	2	1	1	D	98	110	12
C	1	1	1	B	25	48	23
D	1	1	1	A	13	20	7
D	2	1	1	A	13	20	7
D	3	1	1	A	13	20	7

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

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	38	140	213	1800	40	36.45	6.03	57.86	30.63	2.07	32.70
		2	92	-2	522	1800	40	72.43	22.40	220.29	149.13	7.60	156.73
	Ax	1	0	Unrestricted	702	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	80	12	410	1800	35	54.79	15.20	582.68	88.61	5.20	93.81
		2	72	26	129	1800	12	80.55	5.37	205.81	40.98	1.83	42.81
	Bx	1	0	Unrestricted	500	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-6	372	2105	23	109.43	19.11	439.52	160.56	6.38	166.94
	Cx	1	0	Unrestricted	740	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	79	13	352	1800	30	57.29	12.81	106.10	79.54	4.95	84.49
		2	35	154	157	1800	30	39.53	4.55	39.17	24.48	1.64	26.12
		3	32	185	35	1800	7	65.86	1.28	10.66	9.09	0.44	9.53
	Dx	1	0	Unrestricted	248	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	30	198	544	1800	130	0.43	0.07	0.77	0.93	0.00	0.93
	10	1	41	120	735	1800	130	0.69	0.14	2.40	2.00	0.00	2.00
	11	1	30	201	539	1800	130	0.43	0.06	0.99	0.91	0.00	0.91

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	213	213	0		1800	568	38		140	0.00	40
		2	522	522	0		1800	568	92	✓	-2	0.00	40
	Ax	1	702	702	0		Unrestricted	Unrestricted	0		Unrestricted	0.74	130
	B	1	410	410	0		1800	512	80		12	0.00	35
		2	129	129	0		1800	180	72		26	0.00	12
	Bx	1	500	500	0		Unrestricted	Unrestricted	0		Unrestricted	0.70	130
	C	1	372	372	0		2105	389	96	✓	-6	0.00	23
	Cx	1	740	740	0		Unrestricted	Unrestricted	0		Unrestricted	0.61	130
	D	1	352	352	0		1800	443	79		13	0.00	30
		2	157	157	0		1800	443	35		154	0.00	30
		3	35	35	0		1800	111	32		185	0.00	7
	Dx	1	248	248	0		Unrestricted	Unrestricted	0		Unrestricted	0.52	130
	9	1	544	544	0		1800	1800	30		198	0.00	130
	10	1	735	735	0		1800	1800	41		120	0.00	130
	11	1	539	539	0		1800	1800	30		201	0.00	130

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	36.45	2.04	0.11	30.63	77.46	161.88	3.10	2.07
		2	7.02	72.43	6.22	4.28	149.13	116.13	494.18	112.04	7.60
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	54.79	4.71	1.53	88.61	101.14	373.28	41.39	5.20
		2	1.80	80.55	2.03	0.85	40.98	112.94	123.09	22.60	1.83
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	109.43	5.42	5.88	160.56	136.76	362.44	146.31	6.38
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	57.29	4.14	1.46	79.54	112.21	318.44	76.53	4.95
		2	8.01	39.53	1.63	0.10	24.48	83.21	125.32	5.32	1.64
		3	8.27	65.86	0.57	0.07	9.09	100.11	33.07	1.97	0.44
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.43	0.00	0.07	0.93	0.00	0.00	0.00	0.00
	10	1	4.05	0.69	0.00	0.14	2.00	0.00	0.00	0.00	0.00
	11	1	4.47	0.43	0.00	0.06	0.91	0.00	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s (per cycle))	Wasted time blocking back (s (per cycle))	Wasted time total (s (per cycle))	Estimated blocking
08:00-09:00	A	1	0.00	6.03	10.42	57.86	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	22.40	10.17	220.29	4.02	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	35.00	0.00	35.00	
	B	1	0.00	15.20	2.61	582.68	5.40	0.00	0.00	0.00	0.00	0.00	
		2	0.00	5.37	2.61	205.81	0.83	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	C	1	0.00	19.11	4.35	439.52	8.10	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	24.00	0.00	24.00	
	D	1	0.00	12.81	12.07	106.10	0.02	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.55	11.61	39.17	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	1.28	11.98	10.66	0.00	0.00	0.00	5.00	0.00	5.00	
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	15.00	0.00	15.00	
	9	1	0.00	0.07	8.52	0.77	0.00	0.00	0.00	0.00	8.00	8.00	
	10	1	0.00	0.14	5.87	2.40	0.00	0.00	0.00	0.00	85.00	85.00	
	11	1	0.00	0.06	6.47	0.99	0.00	0.00	0.00	0.00	111.00	111.00	

Traffic Stream Results: Journey times

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	12.76	2.58	4.94	43.65
		2	30.53	11.52	2.65	79.44
	Ax	1	99.88	3.33	30.00	17.07
	B	1	6.15	6.45	0.95	56.59
		2	1.94	2.95	0.66	82.35
	Bx	1	65.39	2.18	30.00	15.69
	C	1	9.30	11.62	0.80	112.43
	Cx	1	106.81	3.56	30.00	17.32
	D	1	24.43	6.42	3.81	65.61
		2	10.48	2.07	5.05	47.54
		3	2.41	0.72	3.35	74.13
	Dx	1	38.68	1.29	30.00	18.72
	9	1	26.66	0.95	27.94	6.31
	10	1	24.81	0.97	25.64	4.74
	11	1	20.07	0.73	27.38	4.89

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	6.03	0.11	5.38	1.00	0.00	32.70
		2	0.00	0.00	✓	22.80	4.68	17.58	1.00	0.00	156.73
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	15.23	6.68	11.70	1.00	0.00	93.81
		2	0.00	0.00	✓	5.39	0.88	5.07	1.00	0.00	42.81
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	20.42	7.19	18.15	1.00	0.00	166.94
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	12.84	1.50	10.69	1.00	0.00	84.49
		2	0.00	0.00	✓	4.55	0.10	4.20	1.00	0.00	26.12
		3	0.00	0.00	✓	1.28	0.07	1.26	1.00	0.00	9.53
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.07			1.00	0.00	0.93
	10	1	0.00	0.00	✓	0.14			1.00	0.00	2.00
	11	1	0.00	0.00	✓	0.06			1.00	0.00	0.91

Network Results

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 (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item w wors unsignal PRC
4	06/09/2022 14:48:03	06/09/2022 14:48:05	2.87	08:00	130	616.97	41.33	95.72	C/1	2	13	C/1	10/1

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	96	-6	6198	1127	24.00	586.86	30.10	616.97

Network Results: Flows and signals

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	6198	6198	0		96	✓	-6	1127

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	9.30	24.00	26.76	14.56	586.86	38.74	1991.70	409.26	30.10

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s (per cycle))	Wasted time blocking back (s (per cycle))	Wasted time total (s (per cycle))
08:00-09:00	582.68	0.00	94.00	204.00	298.00

Network Results: Journey times

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	480.29	57.34	8.38

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	616.97

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	131.1	129.5	128.1
	2	97.8	0.0	89.0	69.5
	3	101.5	102.9	0.0	64.1
	4	78.8	80.2	104.3	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journeydist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	21	131.14	180.96	0.00	0.00	0.00	21	131.14	180.96
2	1	3	221	129.50	167.28	0.00	0.00	0.00	221	129.50	167.28
3	1	4	130	128.12	155.77	0.00	0.00	0.00	130	128.12	155.77
12	4	1	286	78.81	196.56	0.00	0.00	0.00	286	78.81	196.56
13	3	1	419	101.51	236.58	0.00	0.00	0.00	419	101.51	236.58
14	2	3	352	89.00	260.68	0.00	0.00	0.00	352	89.00	260.68
17	3	4	213	64.08	224.46	0.00	0.00	0.00	213	64.08	224.46
19	4	2	124	80.20	208.19	0.00	0.00	0.00	124	80.20	208.19
20	3	2	103	102.90	248.21	0.00	0.00	0.00	103	102.90	248.21
21	2	4	157	69.55	246.52	0.00	0.00	0.00	157	69.55	246.52
22	2	1	35	97.76	262.25	0.00	0.00	0.00	35	97.76	262.25
23	4	3	129	104.31	194.51	0.00	0.00	0.00	129	104.31	194.51

Final Prediction Table

Traffic Stream Results

				SIGNALS			FLOWS		PERFORMANCE				PER PCU		
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/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 (%)
A	1	(untitled)	1	1	C		213	1800	40	0.00	38	140	43.65	36.45	77.46
	2	(untitled)	1	1	C		522 <	1800	40	0.00	92	-2	79.44	72.43	116.13
Ax	1	(untitled)					702	Unrestricted	130	35.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	410 <	1800	35	0.00	80	12	56.59	54.79	101.14
	2	(untitled)	1	1	D		129 <	1800	12	0.00	72	26	82.35	80.55	112.94
Bx	1	(untitled)					500	Unrestricted	130	15.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		372 <	2105	23	0.00	96	-6	112.43	109.43	136.76
Cx	1	(untitled)					740	Unrestricted	130	24.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	352 <	1800	30	0.00	79	13	65.61	57.29	112.21
	2	(untitled)	1	1	A	E	157	1800	30	0.00	35	154	47.54	39.53	83.21
	3	(untitled)	1	1	A		35	1800	7	5.00	32	185	74.13	65.86	100.11
Dx	1	(untitled)					248	Unrestricted	130	15.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				544	1800	130	8.00	30	198	6.31	0.43	0.00
10	1		1				735	1800	130	85.00	41	120	4.74	0.69	0.00
11	1		1				539	1800	130	111.00	30	201	4.89	0.43	0.00

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-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	480.29	57.34	8.38	26.76	14.56	586.86	30.10	0.00	616.97
Bus									
Tram									
Pedestrians									
TOTAL	480.29	57.34	8.38	26.76	14.56	586.86	30.10	0.00	616.97

- *< = 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***

A5 - Scenario 2040 - Masterplan (AM)
D5 - Scenario 2040 - Masterplan (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 (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item w wors unsignal PRC
5	06/09/2022 14:48:06	06/09/2022 14:48:07	1.89	08:00	130	2086.80	143.30	124.09	A/2	3	20	A/2	11/1

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
Scenario 2040 - Masterplan (AM)			✓	D5		✓	

Demand Set Details

Scenario name	Time Period name	Description	Composite	Demand sets	Start time (HH:mm)	Locked	Run automatically
Scenario 2040 - Masterplan (AM)					08:00		✓

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
A	L3120 Kilshane Road (East)		1
Ax	(untitled)		
B	R135 (South)		1
Bx	(untitled)		
C	L3120 Kilshane Road (West)		1
Cx	(untitled)		
D	R135 (North)		1
Dx	(untitled)		
9			1
10			1
11			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)		✓	59.92	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	58.48	✓	Sum of lanes	1800	✓		Normal	
Ax	1	(untitled)		✓	142.28						Normal	
B	1	(untitled)			15.00	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)			15.00	✓	Sum of lanes	1800	✓	✓	Normal	
Bx	1	(untitled)		✓	130.77						Normal	
C	1	(untitled)			25.00	✓	Sum of lanes	2105	✓		Normal	
Cx	1	(untitled)		✓	144.33						Normal	
D	1	(untitled)		✓	69.40	✓	Sum of lanes	1800	✓		Normal	
	2	(untitled)		✓	66.73	✓	Sum of lanes	1800	✓		Normal	
	3	(untitled)		✓	68.90	✓	Sum of lanes	1800	✓		Normal	
Dx	1	(untitled)		✓	155.96						Normal	
9	1			✓	49.01	✓	Sum of lanes	1800			Normal	
10	1			✓	33.76	✓	Sum of lanes	1800			Normal	
11	1			✓	37.23	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
A	1	2	(untitled)											1800
	2	1	(untitled)											1800
Ax	1	1	(untitled)											
B	1	2	(untitled)											1800
	2	1	(untitled)											1800
Bx	1	1	(untitled)											
C	1	1	(untitled)		✓	N/A	N/A	-2	4.00	✓	41	25.85		2105
Cx	1	1	(untitled)											
D	1	3	(untitled)											1800
	2	1	(untitled)											1800
	3	2	(untitled)											1800
Dx	1	1	(untitled)											
9	1	1	(untitled)											1800
10	1	1	(untitled)											1800
11	1	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	✓	130

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

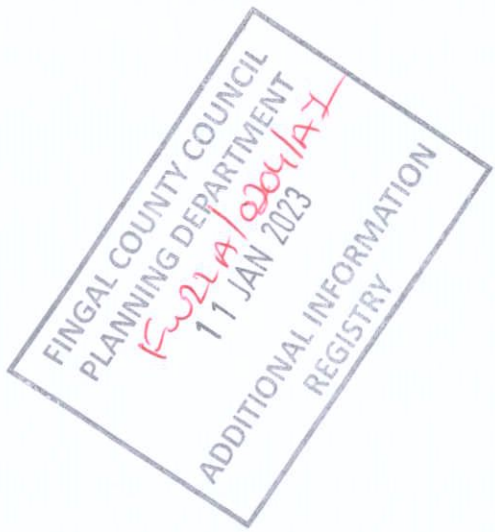
Arm	Traffic Stream	Total Flow (Veh/hr)	Normal Flow (Veh/hr)
A	1	213	213
	2	567	567
Ax	1	702	702
B	1	716	716
	2	129	129
Bx	1	500	500
C	1	372	372
Cx	1	1100	1100
D	1	352	352
	2	157	157
	3	44	44
Dx	1	248	248
9	1	553	553
10	1	780	780
11	1	845	845

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled	Second phase
A	1	1	C		
	2	1	C		
B	1	1	D	✓	E
	2	1	D		
C	1	1	B		
D	1	1	A	✓	E
	2	1	A	✓	E
	3	1	A		

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
C	1	3.00	30.00
9	1	5.88	30.00
10	1	4.05	30.00
11	1	4.47	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	10/1	A/1	7.19	30.00	✓	Straight	Straight Movement
	2	1	10/1	A/2	7.02	30.00	✓	Straight	Straight Movement
Ax	1	1	C/1	Ax/1	17.07	30.00	✓	Straight	Straight Movement
B	1	1	11/1	B/1	1.80	30.00	✓	Offside	98.84
	2	1	11/1	B/2	1.80	30.00	✓	Offside	96.11
Bx	1	1	A/1	Bx/1	15.69	30.00	✓	Nearside	23.54
Cx	1	1	B/1	Cx/1	17.32	30.00	✓	Nearside	33.73
D	1	1	9/1	D/1	8.33	30.00	✓	Straight	Straight Movement
	2	1	9/1	D/2	8.01	30.00	✓	Straight	Straight Movement
	3	1	9/1	D/3	8.27	30.00	✓	Straight	Straight Movement
Dx	1	1	C/1	Dx/1	18.72	30.00	✓	Nearside	25.85
Ax	1	2	D/1	Ax/1	17.07	30.00	✓	Nearside	51.65
Bx	1	2	C/1	Bx/1	15.69	30.00	✓	Offside	43.33
Cx	1	2	A/2	Cx/1	17.32	30.00	✓	Straight	Straight Movement
Dx	1	2	B/1	Dx/1	18.72	30.00	✓	Straight	Straight Movement
Ax	1	3	B/2	Ax/1	17.07	30.00	✓	Offside	42.21
Bx	1	3	D/2	Bx/1	15.69	30.00	✓	Straight	Straight Movement
Cx	1	3	D/3	Cx/1	17.32	30.00	✓	Offside	35.26
Dx	1	3	A/2	Dx/1	18.72	30.00	✓	Offside	74.12

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
B	2	AllTraffic		

Signal Timings

Network Default: 130s cycle time; 130 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	130	76

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)	7	300	0	0	Traffic
	B	(untitled)	23	300	0	0	Traffic
	C	(untitled)	7	300	0	0	Traffic
	D	(untitled)	7	300	0	0	Traffic
	E	(untitled)	7	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	A	1	0	0
	2	B	1	0	0
	3	C	1	0	0
	4	D	1	0	0
	5	E	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, 2, 3, 4, 5	23, 51, 88, 107, 11	76	
	2	(untitled)	Single	1, 2, 3, 5, 4	23, 51, 79, 102, 125	76	
	3	(untitled)	Single	1, 2, 4, 3, 5	23, 51, 79, 107, 0	76	
	4	(untitled)	Single	1, 2, 4, 5, 3	23, 51, 79, 102, 125	76	
	5	(untitled)	Single	1, 2, 5, 3, 4	26, 50, 75, 114, 11	76	
	6	(untitled)	Single	1, 2, 5, 4, 3	23, 51, 74, 97, 125	76	
	7	(untitled)	Single	1, 3, 2, 4, 5	23, 51, 79, 107, 0	76	
	8	(untitled)	Single	1, 3, 2, 5, 4	23, 51, 79, 102, 125	76	
	9	(untitled)	Single	1, 3, 4, 2, 5	23, 51, 79, 107, 0	76	
	10	(untitled)	Single	1, 3, 4, 5, 2	23, 51, 79, 102, 125	76	

Intergreen Matrix for Controller Stream 1

		To				
		A	B	C	D	E
From	A		5	5	5	5
	B	5		5	5	5
	C	5	5		5	5
	D	5	5	5		5
	E	5	5	5	5	

Banned Stage transitions for Controller Stream 1

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

Interstage Matrix for Controller Stream 1

		To				
		1	2	3	4	5
From	1	0	5	5	5	5
	2	5	0	5	5	5
	3	5	5	0	5	5
	4	5	5	5	0	5
	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	A	16	23	7	1	7
	2	✓	2	B	28	51	23	1	23
	3	✓	3	C	56	88	32	1	7
	4	✓	4	D	93	107	14	1	7
	5	✓	5	E	112	11	29	1	7

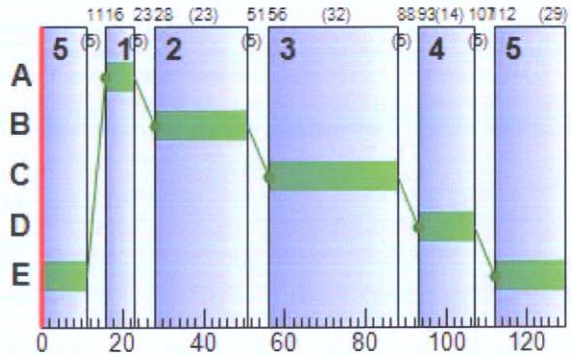
Resultant Phase Green Periods

Controller Stream	Phase	Green period	Is base green period	Start time (s)	End time (s)	Duration (s)
1	A	1	✓	16	23	7
	B	1	✓	28	51	23
	C	1	✓	56	88	32
	D	1	✓	93	107	14
	E	1	✓	112	11	29

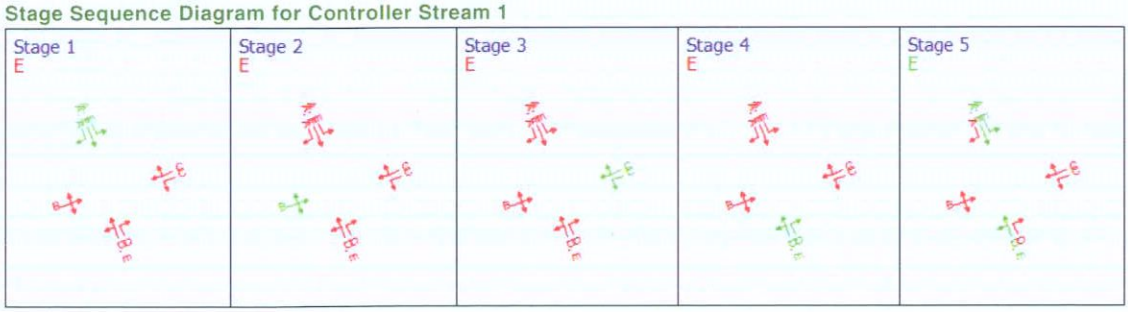
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
A	1	1	1	C	56	88	32
A	2	1	1	C	56	88	32
B	1	1	1	D	93	107	14
B	2	1	1	D	93	107	14
C	1	1	1	B	28	51	23
D	1	1	1	A	16	23	7
D	2	1	1	A	16	23	7
D	3	1	1	A	16	23	7

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

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (Veh)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	47	93	213	1800	32	44.47	6.71	64.40	37.36	2.29	39.65
		2	124	-27	567	1800	32	401.04	73.38	721.51	896.92	16.41	913.34
	Ax	1	0	Unrestricted	702	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	115	-22	716	1800	43	284.93	71.87	2755.04	804.70	18.88	823.58
		2	62	45	129	1800	14	68.61	4.90	187.93	34.91	1.68	36.60
	Bx	1	0	Unrestricted	500	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	96	-6	372	2105	23	109.43	19.11	439.52	160.56	6.38	166.94
	Cx	1	0	Unrestricted	933	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	67	35	352	1800	36	43.92	11.32	93.83	60.98	4.20	65.17
		2	30	202	157	1800	36	34.17	4.25	36.62	21.16	1.52	22.68
		3	40	127	44	1800	7	69.23	1.66	13.82	12.02	0.57	12.58
	Dx	1	0	Unrestricted	212	Unrestricted	130	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	31	193	553	1800	130	0.44	0.07	0.80	0.97	0.00	0.97
	10	1	43	108	780	1800	130	0.76	0.17	2.82	2.35	0.00	2.35
	11	1	47	92	845	1800	130	0.88	0.21	3.20	2.94	0.00	2.94

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Calculated sat flow (Veh/hr)	Calculated capacity (Veh/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	A	1	213	213	0		1800	457	47		93	0.00	32
		2	567	457	0		1800	457	124	✓	-27	0.00	32
	Ax	1	702	702	0		Unrestricted	Unrestricted	0		Unrestricted	0.70	130
	B	1	716	623	0		1800	623	115	✓	-22	0.00	43
		2	129	129	0		1800	208	62		45	0.00	14
	Bx	1	500	500	0		Unrestricted	Unrestricted	0		Unrestricted	0.72	130
	C	1	372	372	0		2105	389	96	✓	-6	0.00	23
	Cx	1	933	933	167	✓	Unrestricted	Unrestricted	0		Unrestricted	0.52	130
	D	1	352	352	0		1800	526	67		35	0.00	36
		2	157	157	0		1800	526	30		202	0.00	36
		3	44	44	0		1800	111	40		127	0.00	7
	Dx	1	212	212	36	✓	Unrestricted	Unrestricted	0		Unrestricted	0.42	130
	9	1	553	553	0		1800	1800	31		193	0.00	130
	10	1	780	780	0		1800	1800	43		108	0.00	130
	11	1	845	845	0		1800	1800	47		92	0.00	130

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	A	1	7.19	44.47	2.43	0.20	37.36	85.60	176.76	5.57	2.29
		2	7.02	401.04	6.16	57.01	896.92	286.50	456.92	852.15	16.41
	Ax	1	17.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	1	1.80	284.93	7.13	49.54	804.70	241.66	623.08	882.65	18.88
		2	1.80	68.61	1.96	0.50	34.91	104.06	120.88	13.35	1.68
	Bx	1	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1	3.00	109.43	5.42	5.88	160.56	136.76	362.44	146.31	6.38
	Cx	1	17.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	1	8.33	43.92	3.63	0.67	60.98	95.11	298.85	35.93	4.20
		2	8.01	34.17	1.43	0.06	21.16	77.35	117.95	3.49	1.52
		3	8.27	69.23	0.72	0.13	12.02	102.99	41.82	3.50	0.57
	Dx	1	18.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	5.88	0.44	0.00	0.07	0.97	0.00	0.00	0.00	0.00
	10	1	4.05	0.76	0.00	0.17	2.35	0.00	0.00	0.00	0.00
	11	1	4.47	0.88	0.00	0.21	2.94	0.00	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (Veh)	Mean max queue (Veh)	Max queue storage (Veh)	Utilised storage (%)	Average storage excess queue (Veh)	Average limit excess queue (Veh)	Excess queue penalty (£ per hr)	Wasted time starvation (s (per cycle))	Wasted time blocking back (s (per cycle))	Wasted time total (s (per cycle))	Estimated blocking
08:00-09:00	A	1	0.00	6.71	10.42	64.40	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	73.38	10.17	721.51	55.02	0.00	0.00	0.00	0.00	0.00	
	Ax	1	0.00	0.00	24.74	0.00	0.00	0.00	0.00	27.00	0.00	27.00	
	B	1	0.00	71.87	2.61	2755.04	58.10	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.90	2.61	187.93	0.57	0.00	0.00	0.00	0.00	0.00	
	Bx	1	0.00	0.00	22.74	0.00	0.00	0.00	0.00	17.00	0.00	17.00	
	C	1	0.00	19.11	4.35	439.52	8.10	0.00	0.00	0.00	0.00	0.00	
	Cx	1	0.00	0.00	25.10	0.00	0.00	0.00	0.00	21.00	0.00	21.00	
	D	1	0.00	11.32	12.07	93.83	0.00	0.00	0.00	0.00	0.00	0.00	
		2	0.00	4.25	11.61	36.62	0.00	0.00	0.00	0.00	0.00	0.00	
		3	0.00	1.66	11.98	13.82	0.00	0.00	0.00	4.00	0.00	4.00	
	Dx	1	0.00	0.00	27.12	0.00	0.00	0.00	0.00	12.00	0.00	12.00	
	9	1	0.00	0.07	8.52	0.80	0.00	0.00	0.00	0.00	0.00	0.00	
	10	1	0.00	0.17	5.87	2.82	0.00	0.00	0.00	0.00	130.00	130.00	
	11	1	0.00	0.21	6.47	3.20	0.00	0.00	0.00	0.00	130.00	130.00	

Traffic Stream Results: Journey times

Time Segment	Arm	Traffic Stream	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	JourneyTime (s)
08:00-09:00	A	1	12.76	3.06	4.18	51.66
		2	33.16	64.27	0.52	408.06
	Ax	1	99.88	3.33	30.00	17.07
	B	1	10.74	57.03	0.19	286.73
		2	1.94	2.52	0.77	70.41
	Bx	1	65.39	2.18	30.00	15.69
	C	1	9.30	11.62	0.80	112.43
	Cx	1	134.68	4.49	30.00	17.32
	D	1	24.43	5.11	4.78	52.24
		2	10.48	1.84	5.70	42.18
		3	3.03	0.95	3.20	77.50
	Dx	1	33.05	1.10	30.00	18.72
	9	1	27.10	0.97	27.90	6.32
	10	1	26.33	1.04	25.24	4.82
	11	1	31.46	1.26	25.05	5.35

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (Veh)	Mean End of Green Queue EoTS (Veh)	Mean End of Red Queue EoTS (Veh)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	A	1	0.00	0.00	✓	6.71	0.20	5.94	1.00	0.00	39.65
		2	0.00	0.00	✓	128.47	112.10	124.41	1.00	0.00	913.34
	Ax	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	B	1	0.00	0.00	✓	118.46	105.25	110.15	1.00	0.00	823.58
		2	0.00	0.00	✓	4.91	0.50	4.62	1.00	0.00	36.60
	Bx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	C	1	0.00	0.00	✓	20.42	7.19	18.15	1.00	0.00	166.94
	Cx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	D	1	0.00	0.00	✓	11.33	0.67	9.28	1.00	0.00	65.17
		2	0.00	0.00	✓	4.25	0.06	3.90	1.00	0.00	22.68
		3	0.00	0.00	✓	1.66	0.13	1.62	1.00	0.00	12.58
	Dx	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.07			1.00	0.00	0.97
	10	1	0.00	0.00	✓	0.17			1.00	0.00	2.35
	11	1	0.00	0.00	✓	0.21			1.00	0.00	2.94

Network Results

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 (Veh-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item w wors unsignal PRC
5	06/09/2022 14:48:06	06/09/2022 14:48:07	1.89	08:00	130	2086.80	143.30	124.09	A/2	3	20	A/2	11/1

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (Veh/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	124	-27	7075	1133	72.92	2034.87	51.93	2086.80

Network Results: Flows and signals

Time Segment	Calculated flow entering (Veh/hr)	Calculated flow out (Veh/hr)	Flow discrepancy (Veh/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	7075	6872	203	✓	124	✓	-27	1133

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Uniform stops (Stops per hr)	Random stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	8.88	72.92	28.87	114.43	2034.87	66.17	2198.70	1942.94	51.93

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time starvation (s (per cycle))	Wasted time blocking back (s (per cycle))	Wasted time total (s (per cycle))
08:00-09:00	2755.04	0.00	81.00	260.00	341.00

Network Results: Journey times

Time Segment	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)
08:00-09:00	523.72	160.76	3.26

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	2086.80

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	131.1	129.5	128.1
	2	101.1	0.0	75.6	64.2
	3	430.2	431.6	0.0	72.2
	4	309.4	310.8	92.8	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (Veh/hr)	Normal journey time (s)	Normal journey dist (m)	Bus journeydist (m)	Tram journey dist (m)	Pedestrian journey dist (m)	Calculated Total Flow (Veh/hr)	Avg journey time (s)	Avg journey dist (m)
1	1	2	21	131.14	180.96	0.00	0.00	0.00	21	131.14	180.96
2	1	3	221	129.50	167.28	0.00	0.00	0.00	221	129.50	167.28
3	1	4	130	128.12	155.77	0.00	0.00	0.00	130	128.12	155.77
12	4	1	592	309.40	196.56	0.00	0.00	0.00	592	309.40	196.56
13	3	1	464	430.19	236.58	0.00	0.00	0.00	464	430.19	236.58
14	2	3	352	75.64	260.68	0.00	0.00	0.00	352	75.64	260.68
17	3	4	213	72.17	224.46	0.00	0.00	0.00	213	72.17	224.46
19	4	2	124	310.79	208.19	0.00	0.00	0.00	124	310.79	208.19
20	3	2	103	431.59	248.21	0.00	0.00	0.00	103	431.59	248.21
21	2	4	157	64.19	246.52	0.00	0.00	0.00	157	64.19	246.52
22	2	1	44	101.14	262.25	0.00	0.00	0.00	44	101.14	262.25
23	4	3	129	92.84	194.51	0.00	0.00	0.00	129	92.84	194.51

Final Prediction Table

Traffic Stream Results

				SIGNALS			FLOWS		PERFORMANCE				PER PCU		
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Second phase	Calculated flow entering (Veh/hr)	Calculated sat flow (Veh/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 (%)
A	1	(untitled)	1	1	C		213	1800	32	0.00	47	93	51.66	44.47	85.60
	2	(untitled)	1	1	C		567 <	1800	32	0.00	124	-27	408.06	401.04	286.50
Ax	1	(untitled)					702	Unrestricted	130	27.00	0	Unrestricted	17.07	0.00	0.00
B	1	(untitled)	1	1	D	E	716 <	1800	43	0.00	115	-22	286.73	284.93	241.66
	2	(untitled)	1	1	D		129 <	1800	14	0.00	62	45	70.41	68.61	104.06
Bx	1	(untitled)					500	Unrestricted	130	17.00	0	Unrestricted	15.69	0.00	0.00
C	1	(untitled)	1	1	B		372 <	2105	23	0.00	96	-6	112.43	109.43	136.76
Cx	1	(untitled)					933	Unrestricted	130	21.00	0	Unrestricted	17.32	0.00	0.00
D	1	(untitled)	1	1	A	E	352	1800	36	0.00	67	35	52.24	43.92	95.11
	2	(untitled)	1	1	A	E	157	1800	36	0.00	30	202	42.18	34.17	77.35
	3	(untitled)	1	1	A		44	1800	7	4.00	40	127	77.50	69.23	102.99
Dx	1	(untitled)					212	Unrestricted	130	12.00	0	Unrestricted	18.72	0.00	0.00
9	1		1				553	1800	130	0.00	31	193	6.32	0.44	0.00
10	1		1				780	1800	130	130.00	43	108	4.82	0.76	0.00
11	1		1				845	1800	130	130.00	47	92	5.35	0.88	0.00

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Uniform delay (Veh-hr/hr)	Random plus oversat delay (Veh-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	523.72	160.76	3.26	28.87	114.43	2034.87	51.93	0.00	2086.80
Bus									
Tram									
Pedestrians									
TOTAL	523.72	160.76	3.26	28.87	114.43	2034.87	51.93	0.00	2086.80

- *< = 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 TO SECTION 14

WASTE MANAGEMENT

APPENDIX 14.1

Resource Waste Management Plan

RESOURCE WASTE MANAGEMENT PLAN FOR A PROPOSED POWER GENERATOR STATION, KILSHANE AND PIPERSTOWN, KILSHANE ROAD, DUBLIN 11

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APPENDIX 14.1

Report Prepared For

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Report Prepared By

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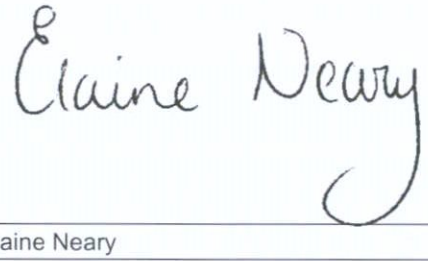
Signature		
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1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Resource Waste Management Plan (RWMP) on behalf of Kilshane Energy Ltd. The proposed development comprises the construction of a gas turbine power generator station with an output of up to 293 Megawatts, the application of which includes a turbine, an associated exhaust stack, two air cooled condenser units, administration and control building, workshop, stores, fuel gas area, electrical module for fuel gas area, step-up transformer, black start diesel generator, transfer compound, three reserve fuel storage tanks and recessed bund area, miscellaneous plant, and equipment.

The Environmental Protection Agency (EPA) of Ireland issued *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* in 2021. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006. The RWMP would be the replacement document for the Construction & Demolition Waste Management Plan. Further detail can be found in section 2.

This plan will provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with the current legal and industry standards including the *Waste Management Act 1996* as amended and associated Regulations [1], *Environmental Protection Agency Act 1992* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* [4]. In particular, this plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This RWMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the Proposed Development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and will be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible

2.0 RESOURCE & WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998, *Changing Our Ways* [5], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e. 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled '*Recycling of Construction and Demolition Waste*' [6] concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, *'A Waste Action*

Plan for a Circular Economy' [7] (WAPCE), replaces the previous national waste management plan, *"A Resource Opportunity"* (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) [8] to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Circular Economy and Miscellaneous Provisions Act 2022 [9] was signed into law in July 2022. The Act underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in our economy for as long as possible and that will to significantly reduce our greenhouse gas emissions. The Act defines Circular Economy for the first time in Irish law, incentivises the use of recycled and reusable alternatives to wasteful, single-use disposable packaging, introduces a mandatory segregation and incentivised charging regime for commercial waste, streamlines the national processes for End-of-Waste and By-Products decisions, tackling the delays which can be encountered by industry, and supporting the availability of recycled secondary raw materials in the Irish market, and tackles illegal fly-tipping and littering.

The Environmental Protection Agency (EPA) of Ireland issued '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021* [10]. These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for Resource Waste Manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies i.e. waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

A development which exceeds one or more of these thresholds is classed as a Tier-2 project. This development is a Tier 2 development as it exceeds the below thresholds.

- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* [11], published by FÁS and the Construction Industry Federation in 2002 and the previous guildines, 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2 Regional Level

The proposed development is located in the Local Authority area of Fingal County Council (FCC).

The *Eastern-Midlands Region Waste Management Plan 2015 – 2021* is the regional waste management plan for the FCC area published in May 2015. Currently the EMR and other regional waste management plans are under review and the Regional Waste Management Planning Offices expect to publish the final plan in early 2022.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *"70% preparing for reuse, recycling and other recovery of construction and demolition waste"* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012.*

The *Fingal Development Plan 2017 – 2023* [11] came into effect on March 2017 and sets out a number of objectives for the Fingal region in line with the objectives of the regional waste management plan.

Objectives:

- Objective **WM03** Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015 -2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions

of the Regional Waste Management Plan and adhere to the requirements of that Plan.

- Objective **WM07** Promote the increased re-use of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015 -2021 (or any subsequent plan).
- Objective **WM18** Ensure that construction and demolition Waste Management Plans meet the relevant recycling / recovery targets for such waste in accordance with the national legislation and regional waste management policy.
- *Objective **DMS36** Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened alcoves or other such mitigation measures are provided.*
- *Objective **DMS37** Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*

With regard to C&D waste specifically, the Development Plan requires that a 70% target for the re-use, recycling and recovery of man-made C&D waste in Ireland by 2020 is required in compliance with the EC (Waste Directive) Regulations 2011.

The Draft *Fingal Development Plan 2023– 2029* [13] (2022) and sets out a number of policies and objectives for the Fingal region in line with the objectives of the regional waste management plan, including the following:

- Objective **DMSO31:** *Ensure all new residential schemes include appropriate design measures for refuse storage areas, details of which should be clearly shown at pre-planning and planning application stage. Ensure refuse storage areas are not situated immediately adjacent to the front door or ground floor window, unless adequate screened or other such mitigation measures are provided.*
- Objective **DMSO32:** *Ensure the maximum distance between the front door to a communal bin area does not exceed 50 metres.*
- ***Objective IUO34** – Waste Management in New Developments -*
  Require the provision of appropriate, well designed, accessible space to support the storage, separation and collection of as many waste and recycling streams as possible in all new commercial and residential developments within the County.
- ***Objective DMSO235 –** Provision of Public Bring Banks - Ensure the provision of public bring banks in all large retail developments, unless there are existing facilities within a 1 km radius. Bring bank facilities will generally be required at appropriate locations in the following development types:*
  - *In conjunction with significant new commercial developments, or extensions to existing developments.*
  - *In conjunction with new waste infrastructure facilities, proposals should include bring facilities for the acceptance of non-hazardous and hazardous wastes from members of the public and small businesses.*
  - *In conjunction with medium and large scale residential and mixed-use developments providing in excess of 10 residential units, proposals should provide recycling and bring bank facilities to serve residents and in some appropriate locations, the wider community.*
  - *In conjunction with all large retail developments provide space for reverse vending machines to promote the circular economy.*
- ***Objective DMSO236** – Communal Refuse Storage Provision - In the case of communal refuse storage provision, the collection point for refuse should be accessible both to the external collector and to the resident and be secured against illegal dumping by non-residents. In the case of individual houses, the*

applicant shall clearly show within a planning application the proposed location and design of bin storage to serve each dwelling, and having regard to the number of individual bins required to serve each dwelling at the time of the application and any possible future requirements for refuse storage/collection. The following criteria will be considered in the assessment of the design and siting of waste facilities and bring facilities:

- *The location and design of any refuse storage or recycling facility should ensure that it is easily accessible both for residents and/or public and for bin collection, be insect and vermin proofed, will not present an odour problem, and will not significantly detract from the residential amenities of adjacent property or future occupants.*
- *Provision for the storage and collection of waste materials shall be in accordance with the guidelines for waste storage facilities in the relevant Regional Waste Management Plan and the design considerations contained in Section 4.8 and 4.9 of the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities, DHLGH (2020).*
- *Refuse storage for houses should be externally located, concealed / covered and adequate to cater for the size and number of bins normally allocated to a household. For terraced houses, the most appropriate area for bins to be stored is to the front of the house, which should be located in well-designed enclosures that do not to detract from visual amenity.*
- *All applications shall clearly identify the waste storage and collection points and detail the anticipated waste collection schedule having regard to the impact on road users both within the development and the surrounding area.*
- *Access to private waste storage in residential schemes should be restricted to residents only.*

- ***Objective DMSO237** – Segregation and Collection of Waste - Ensure all new large-scale residential and mixed-use developments include appropriate facilities for source segregation and collection of waste.*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended [14].

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2001* and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the developer ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that

ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste or IE licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESIGN APPROACH

The client and the design team have integrated the *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* guidelines into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

4.0 DESCRIPTION OF THE PROJECT

4.1 Location, Size and Scale of the Development

The proposed development comprises the construction of a gas turbine power generator station with an output of up to 293 Megawatts, the application of which includes a turbine, an associated exhaust stack, two air cooled condenser units, administration and control building, workshop, stores, fuel gas area, electrical module for fuel gas area, step-up transformer, black start diesel generator, transfer compound, three reserve fuel storage tanks and recessed bund area, miscellaneous plant, and equipment.

The proposed development will also include 26 no. staff car parking spaces, site and landscaping works, and all associated ancillary site development infrastructure such as foul and surface water drainage works and internal roads, footpaths, access routes, and all associated engineering and construction site works necessary to facilitate the development. Additionally, the proposal includes the realignment of a section of the

Kilshane road and construction of a new roundabout junction (bounding the site to the east).

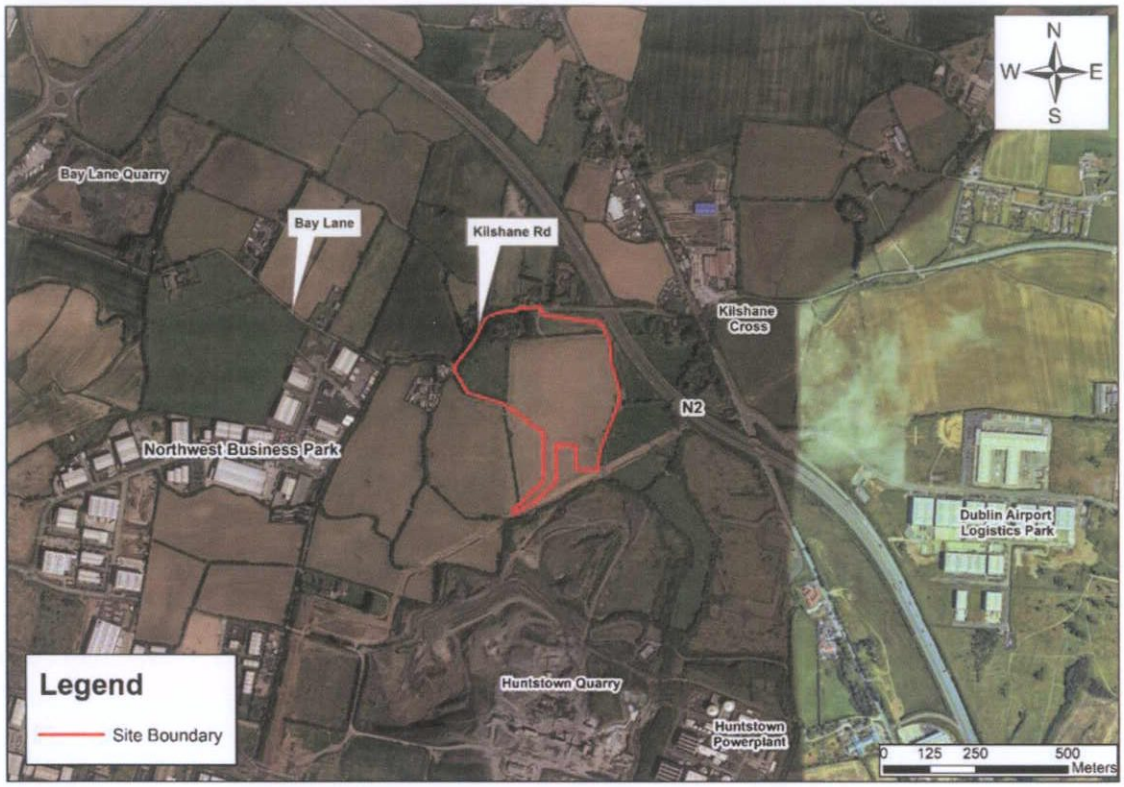

Figure 3.1 Proposed site location

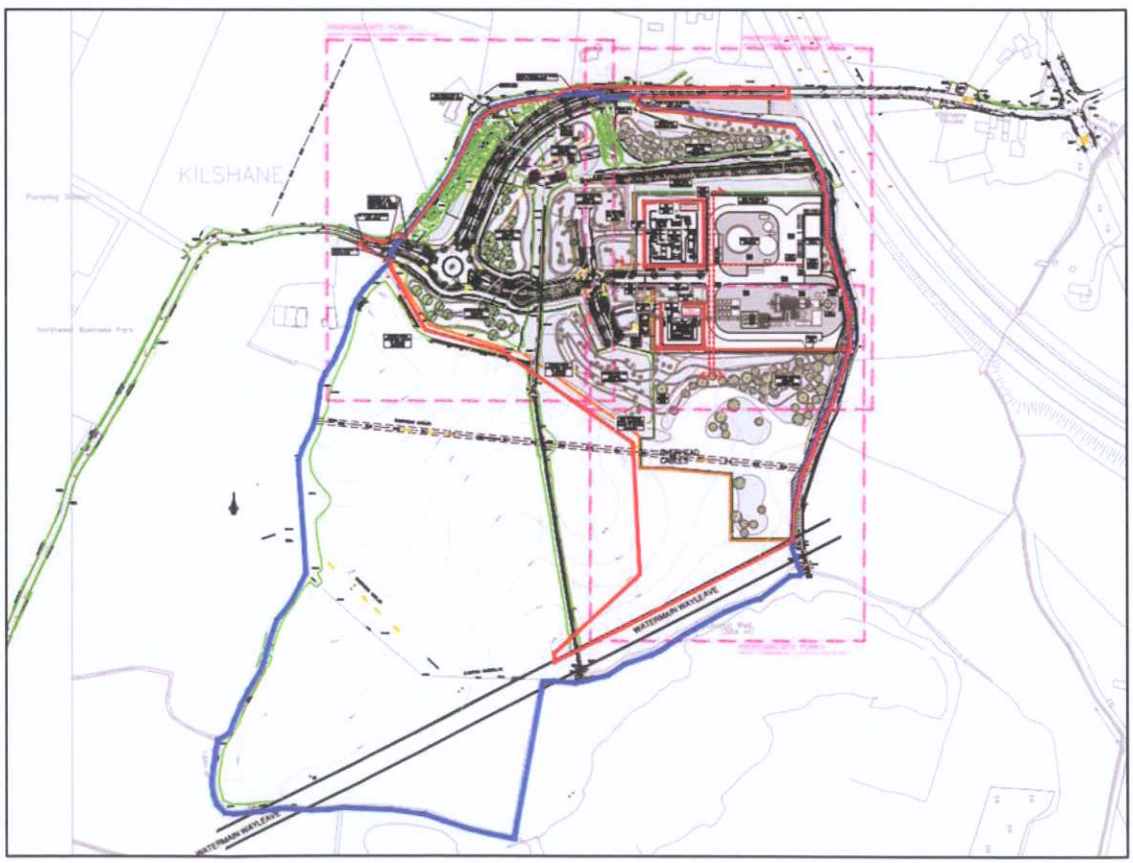

Figure 3.2 Proposed site layout