

December 6, 2019

PROJECT NUMBER 17163

Mr. Andrew Gameiro
City of Barrie
Planning Services Department
70 Collier Street
Barrie, ON L4M 4T5

Dear Mr. Gameiro

**Re: D12-444 D14-1674 750 Lockhart Road – Response to Comments
Draft Plan of Subdivision**

The Municipal Infrastructure Group (TMIG) previously submitted a Traffic Impact Study (TIS) in support of the proposed Draft Plan of Subdivision residential development within what is known as Phase 1 and Phase 3 lands of the Hewitt's Secondary Plan in the City of Barrie (dated March, 2019). TMIG was subsequently retained to provide comments in response to the City of Barrie's review of the TIS (dated June 2019).

In response to the City of Barrie's transportation/traffic comments (attached), TMIG is pleased to provide the following itemized responses.

Comment 1: The applicant shall provide turning template to ensure maintenance vehicles are able to navigate the proposed traffic calming features

*Response: Please see attached Vehicle Movement Diagrams **VMD-1** to **VMD-13** that provide navigation of an emergency vehicle (fire), intercity bus, and snow plough through the proposed traffic calming features. All vehicles comply with standards provided by the City of Barrie.*

Comment 2: Staff recommend the proposed western median island to be reduced to the west to permit a left turn lane onto Street 3. This is to remove the potential delay for vehicles waiting to turn left onto Street 3 which will impede the through movement.

*Response: After discussion with the City of Barrie, this is no longer a concern. The western median is more than 10 meters away from the centre of pavement on Street 3. However, further to TMIG's discussions with City staff, the Kneeshaw Drive pavement markings located south of Street '2' were modified by removing the 'median' pavement markings in front of Block 8. The raised concrete median was subsequently shortened (to the south) to accommodate the revised markings (see attached updated **Figures CD-1 and CD-4**).*

Comment 3: Identify the driveway placement for the easterly lot on Block 7 to ensure there is no conflict with the proposed easterly median island.

*Response: Attached **Figure CD-4** identifies the 6.0m wide double driveway placement for the easterly lot on Block 7. Please see attached passenger vehicle movement diagrams (**VMD-14** and **VMD-15**) that show no conflict for passenger vehicles with the proposed easterly median island.*

Comment 4: Staff do not support the proposed traffic calming features identified through the NHS. Staff recommend the applicant review the feasibility of implementing other traffic calming features identified in the Traffic Impact Study. These features include raised median island and curb extensions. These features would still achieve the desired traffic calming affect with minimalizing ongoing maintenance and could allow for potential landscape.

Response: *Upon discussions with the City of Barrie, it is agreed that there may be other traffic calming features that may be appropriate to consider. It was agreed that the specific features can be determined at time of detailed design stage given that the traffic calming features will fit within the R.O.W. width shown on the Draft Plan.*

Comment 5: Staff have identified the intersection of Kneeshaw Drive and Lockhart Road to operate under traffic control signal. The applicant must update the TIS to reflect this. The updated review must include a queuing study to ensure the proposed roundabout location provides sufficient storage in accordance with the Class EA for Lockhart Road.

Response: *As noted in the March 2019 TIS, under 2031 traffic conditions, traffic signals are not strictly speaking warranted at the intersection of Kneeshaw Drive and Lockhart Road (see attached OTM signal warrant analysis). As future Phases of the Hewitt Secondary Plan come online, further discussion with the City is merited to determine when delivery of the traffic lights is warranted.*

Furthermore, review of the following City of Barrie reports/studies provided no discussion related to the signalization of Kneeshaw Drive and Lockhart Road:

- *Development Charge (DC) Background Study, May 2019;*
- *Hewitt's Secondary Plan Class EA Study (Phases 3 and 4), October 2017;*
- *Transportation Master Plan, April 2019; and*
- *Draft Plan of Subdivisions, HLG, Updated Master Transportation Study, October 2018*

It is requested that City staff identify the Kneeshaw Dove at Lockhart Road intersection in future DC Background Studies and subsequent infrastructure costs to ensure that if this intersection is required to operate under traffic control signal a DC credit will be applied accordingly.

*Notwithstanding the above, it is acknowledged that City staff requested a sensitivity analysis of the Kneeshaw Drive and Lockhart Road intersection to confirm operation characteristics, and southbound queuing, under traffic control signal. The results of the intersection capacity analysis at the study intersection during the a.m. and p.m. peak hours are summarized in **Table 1**. The detailed Synchro output sheets are attached. It should be noted that the capacity and queuing analysis provided herein reflects the ultimate horizon year of 2031 future total traffic conditions.*

TABLE 1 CAPACITY ANALYSIS OF KNEESHAW DRIVE AT LOCKHART ROAD

Scenario	Movement of Interest	Weekday AM Peak Hour			Weekday PM Peak Hour		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Total 2031 (SIGNALIZED)	Overall	0.47	14	B	0.49	19	B
	Eastbound Left	0.37	15	B	0.92	46	D
	Eastbound Through	0.24	13	B	0.54	13	B
	Westbound Through/Right	0.65	16	B	0.33	12	B
	Southbound Left/Right	0.34	11	B	0.08	10	A

Under future 2031 total traffic conditions, the signalized intersection of Kneeshaw Drive at Lockhart Road is expected to operate with acceptable operational characteristics during both the weekday a.m. and p.m. peak hours. The intersection operates with an overall v/c ratio of 0.47 and 0.49 during the weekday a.m. and p.m. peak hours, respectively, and has an overall LOS of 'B' during both peak hours. Individual movements are operating with some reserve capacity during both peak hours experience LOS 'D' or better.

Queueing analysis, under future 2031 total traffic conditions, was completed using SimTraffic Version 10 microsimulation software based on 5 simulation runs, each run consisting of a 10 minute seeding time and a 60 minute recording time simulation run (see attached SimTraffic output reports). The southbound 95th percentile queue length is expected to extend approximately 35 metres north of the stop bar at Lockhart Road.

The proposed roundabout is located approximately 70 metres north of the Lockhart Road intersection, measured from the southbound stop bar at Lockhart Road to the splitter island located on the south leg of the roundabout. As a result, the proposed roundabout location provides sufficient storage to accommodate the expected 35 metres queue length, in accordance with the Class EA for Lockhart Road.

We trust the enclosed is sufficient for your needs, but please do not hesitate to contact the undersigned should you require any additional assistance.

Sincerely,
THE MUNICIPAL INFRASTRUCTURE GROUP LTD.



Michael Dowdall, C.E.T., MITE
Project Manager
mdowdall@tmig.ca

Attachments:

1. City of Barrie Traffic and Parking Services Comments
2. Conceptual Design Drawings and Vehicle Movement Diagrams
3. OTM Traffic Signal Warrant Analysis
4. Updated Synchro Capacity Analysis Reports
5. Updated SimTraffic Queueing Reports



Traffic and Parking Services Draft Plan of Subdivision

To: F. Palka, C.E.T., Manager of Development Services

From: J. MacDonald C.E.T., Senior Transportation Operations Technologist (Ext. 5178)

Date: June 6, 2019

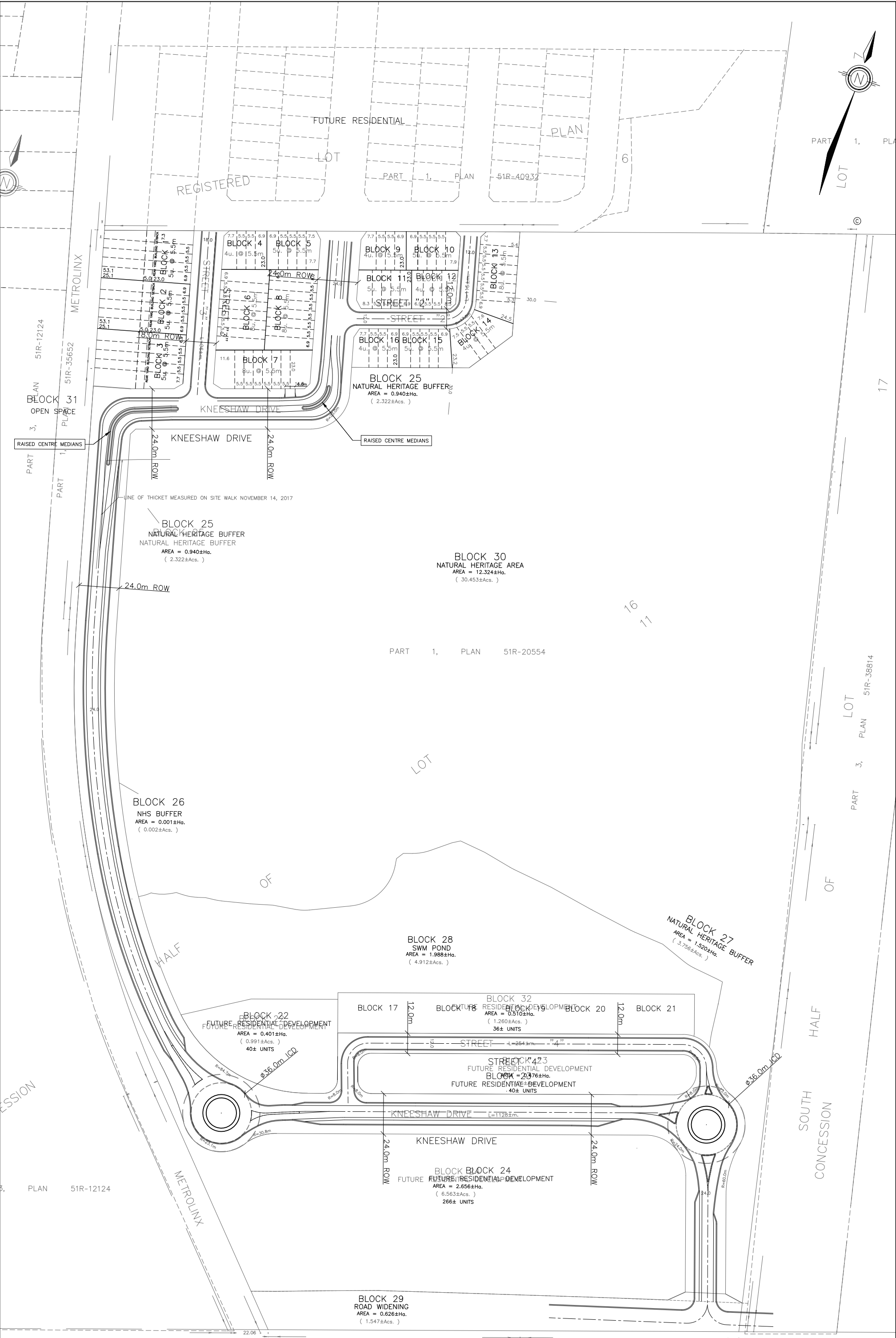
Re: D12-444 D14-1674 750 Lockhart Road

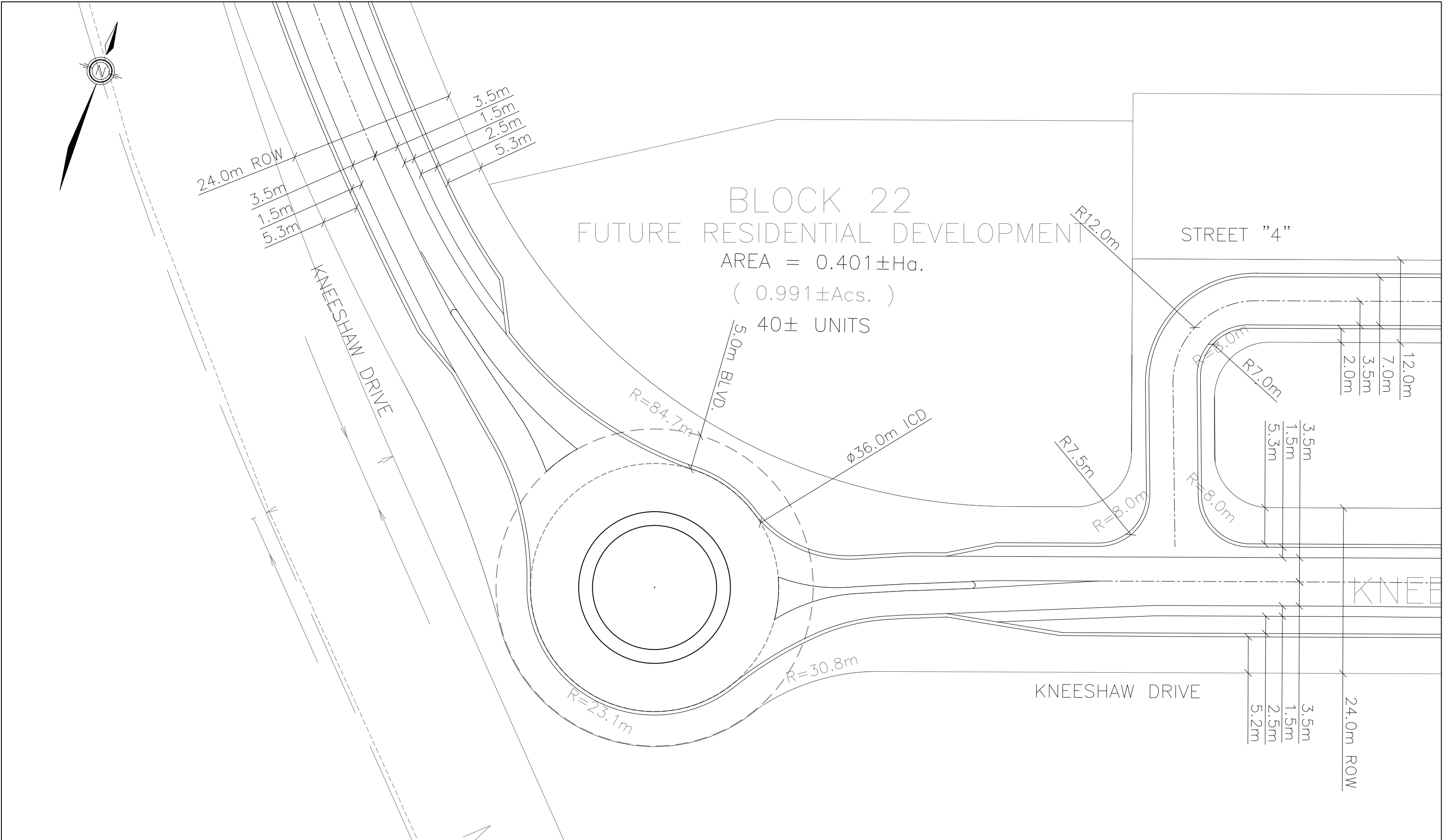
Staff reviewed the proposed plan of subdivision for D12-444, D14-1674 for 750 Lockhart Road.

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5. Staff have identified the intersection of Kneeshaw Drive and Lockhart Road to operate under traffic control signal. The applicant must update the TIS reflect this. The updated review must include a queuing study to ensure the proposed round about location provides sufficient storage in accordance with the Class EA for Lockhart Road.

A handwritten signature in black ink that reads "Justin MacDonald".

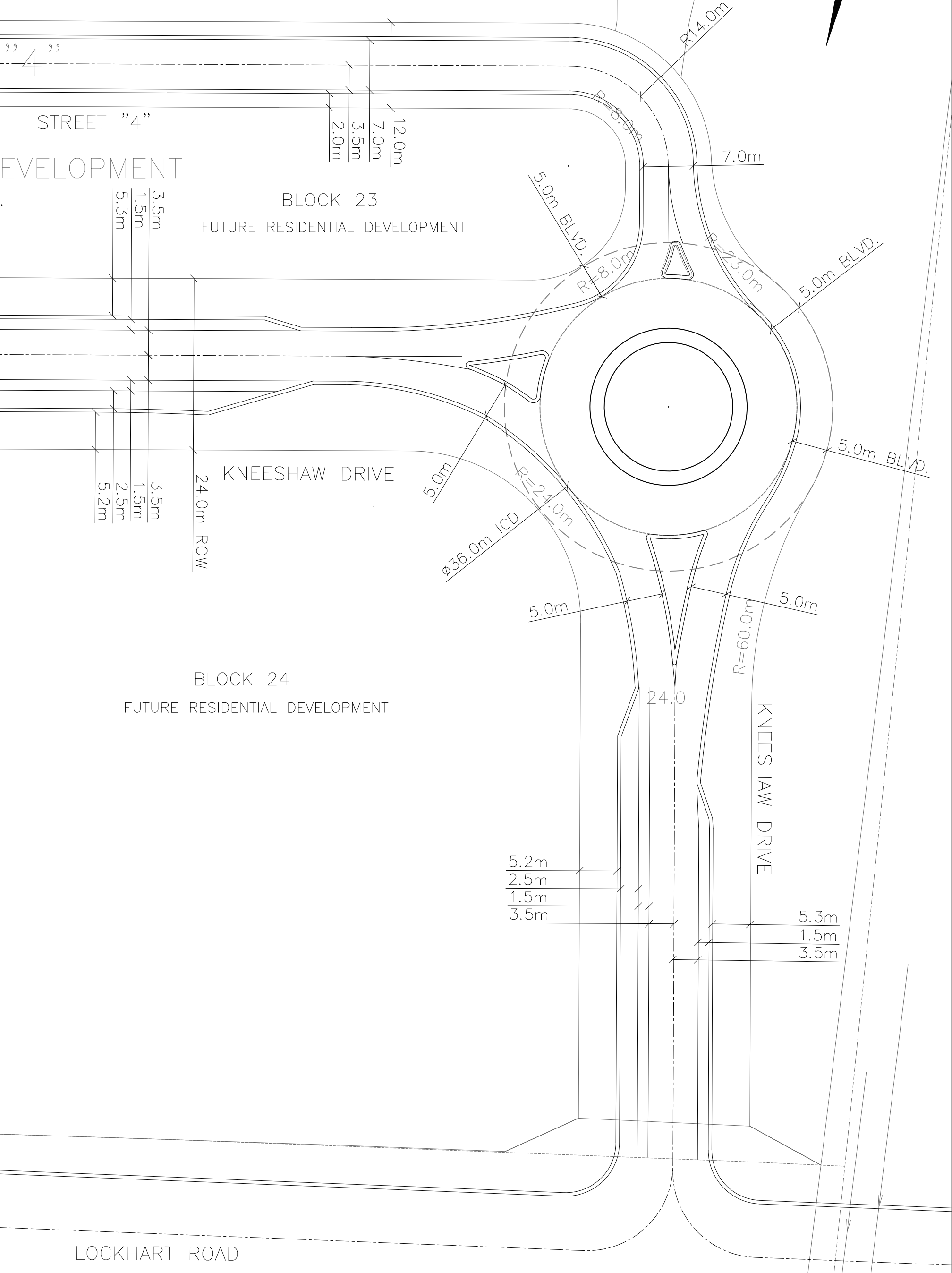
Justin MacDonald, C.E.T.
Senior Transportation Operations Technologist

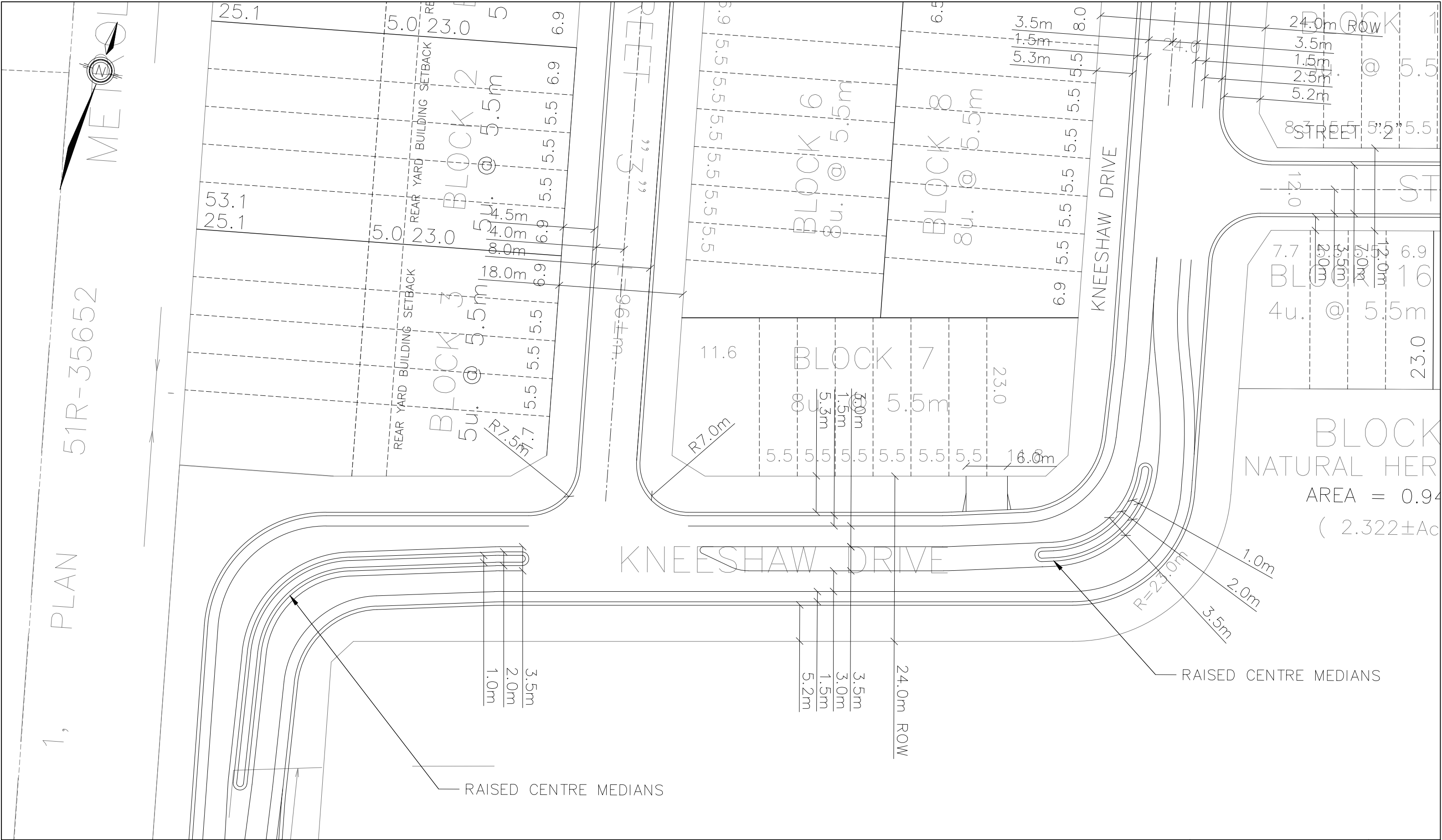




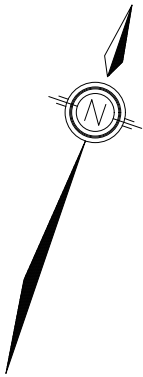
OPMENT

EVELOPMENT





OPMENT



STREET "4"

EVELOPMENT

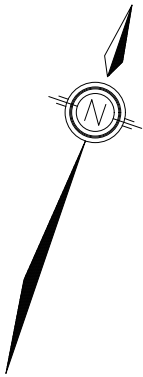
BLOCK 23
FUTURE RESIDENTIAL DEVELOPMENT

KNEESHAW DRIVE

BLOCK 24
FUTURE RESIDENTIAL DEVELOPMENT

LOCKHART ROAD

DEVELOPMENT



STREET "4"

DEVELOPMENT

BLOCK 23
FUTURE RESIDENTIAL DEVELOPMENT

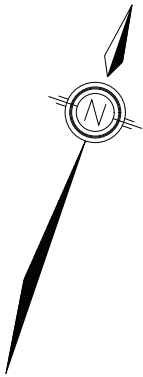
KNEESHAW DRIVE

BLOCK 24
FUTURE RESIDENTIAL DEVELOPMENT

KNEESHAW DRIVE

LOCKHART ROAD

OPMENT



STREET "4"

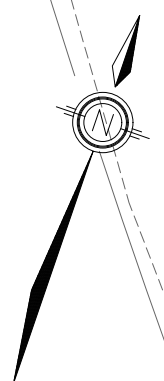
EVELOPMENT

BLOCK 23
FUTURE RESIDENTIAL DEVELOPMENT

KNEESHAW DRIVE

BLOCK 24
FUTURE RESIDENTIAL DEVELOPMENT

LOCKHART ROAD



BLOCK 22
FUTURE RESIDENTIAL DEVELOPMENT
AREA = 0.401±Ha.
(0.991±Acs.)
40± UNITS

KNEESHAW DRIVE

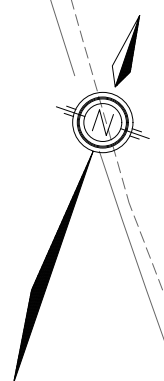
STREET "2"

R=8.0m
R=8.0m
R=8.0m

KNEES

R=84.7m
R=30.8m
R=23.1m

FUTUR



BLOCK 22
FUTURE RESIDENTIAL DEVELOPMENT
AREA = $0.401 \pm H_a$.
($0.991 \pm A_{cs}$.)
40 $\pm$ UNITS

KNEESHAW DRIVE

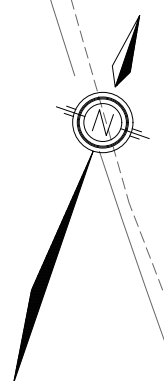
STREET "2"

R=8.0m
R=8.0m
R=8.0m

KNEES

R=84.7m
R=30.8m
R=23.1m

FUTUR



BLOCK 22
FUTURE RESIDENTIAL DEVELOPMENT
AREA = $0.401 \pm \text{Ha.}$
($0.991 \pm \text{Acs.}$)
40 $\pm$ UNITS

KNEESHAW DRIVE

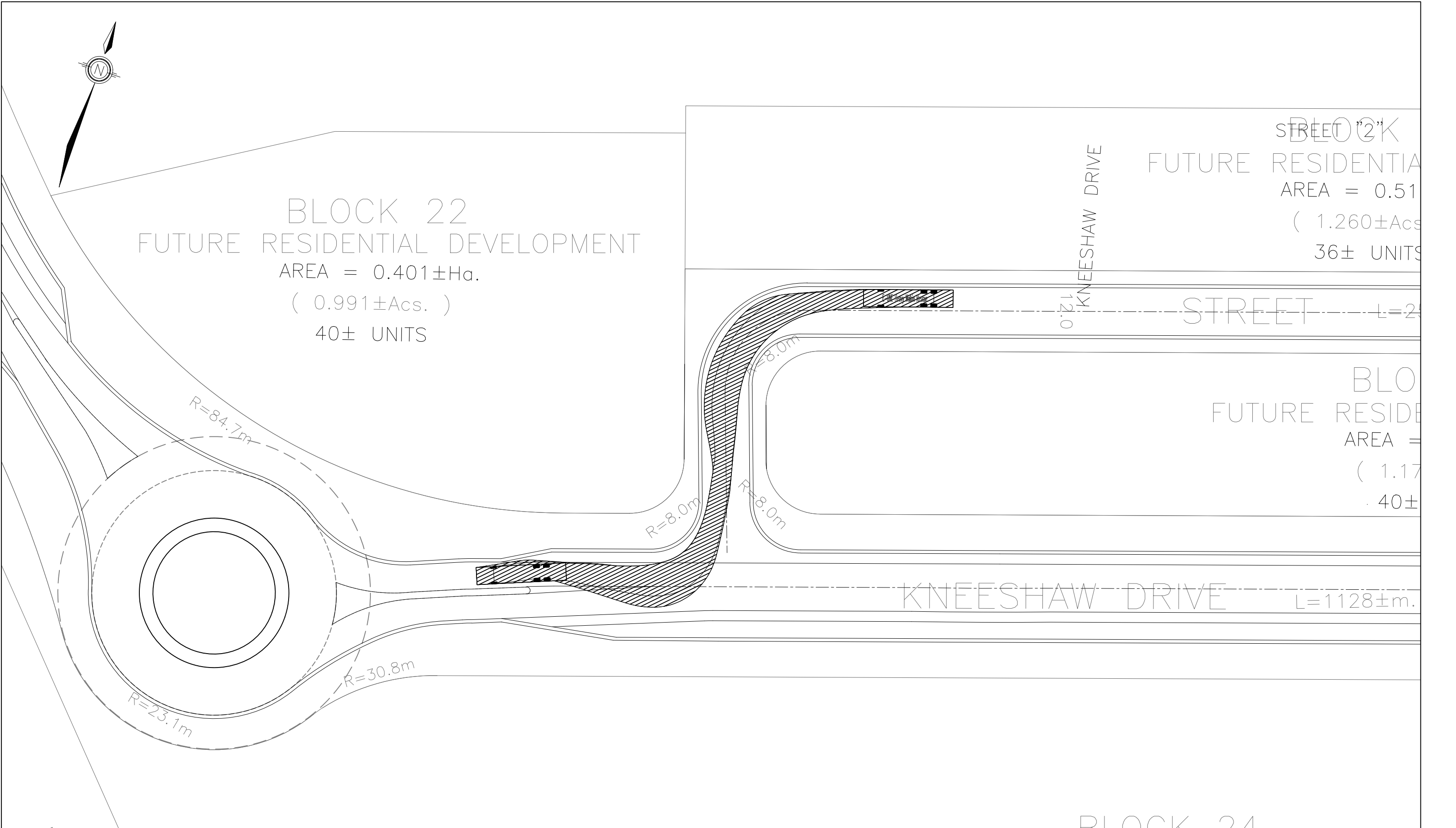
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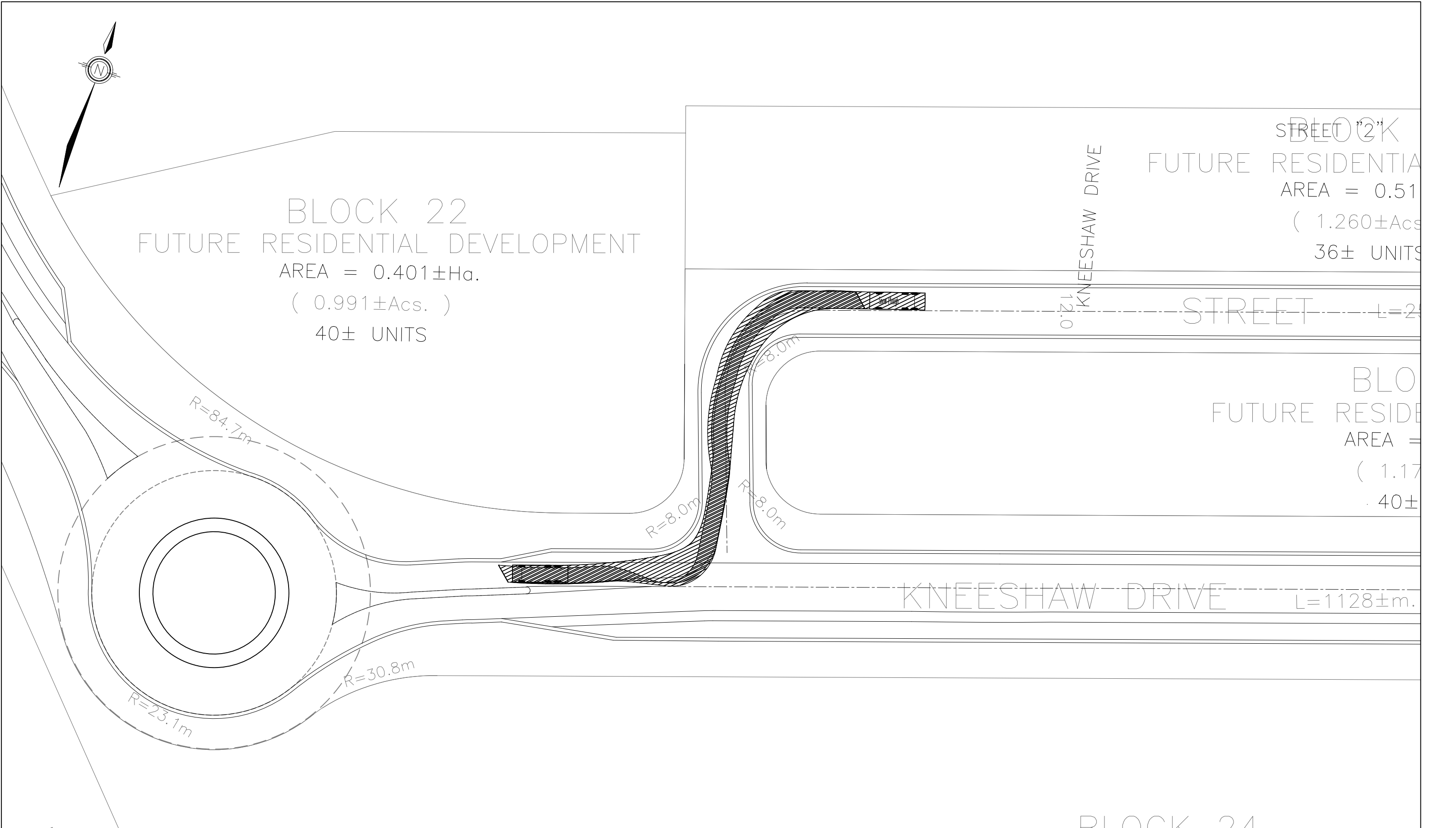
R=8.0m
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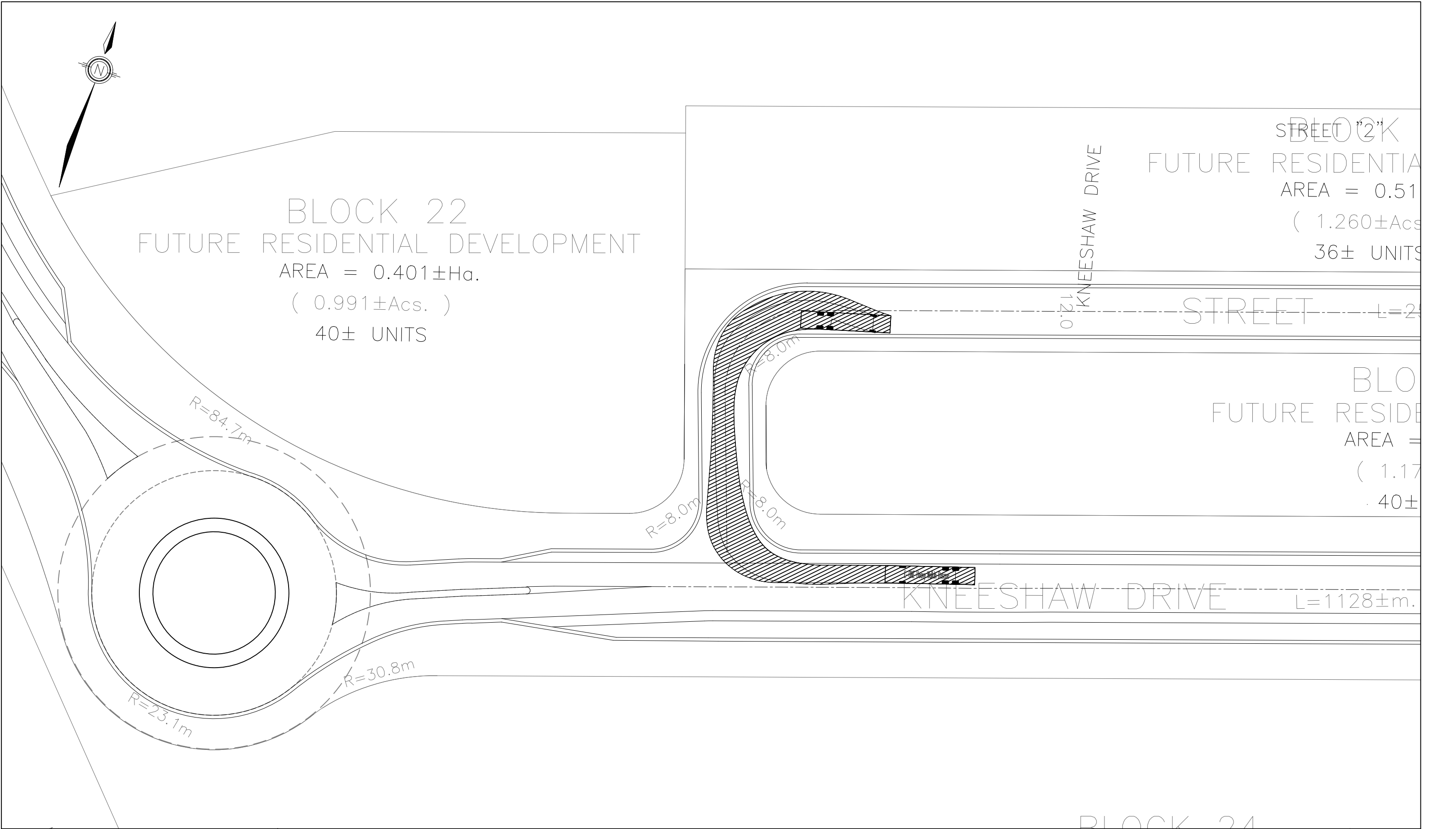
KNEES

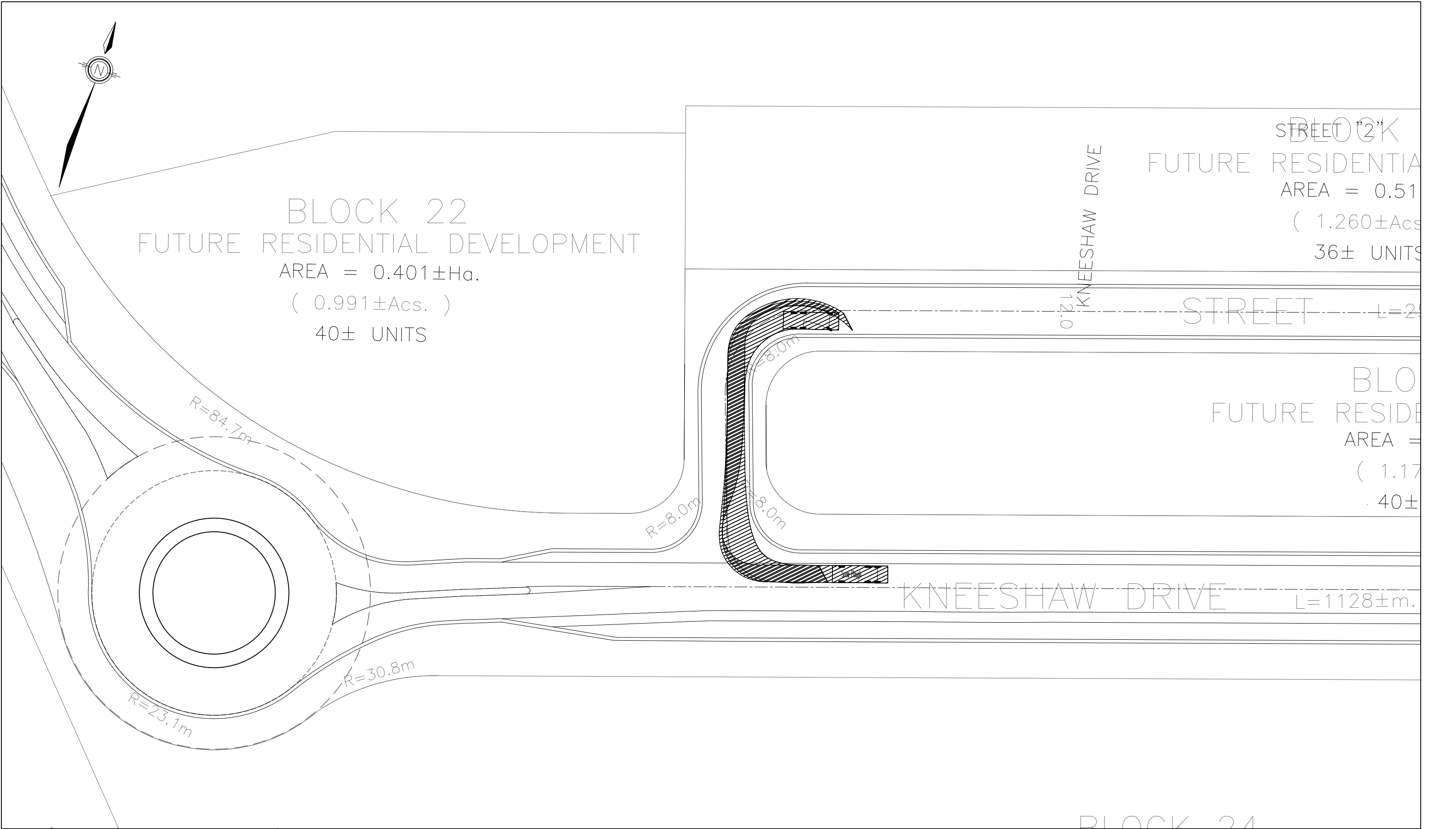
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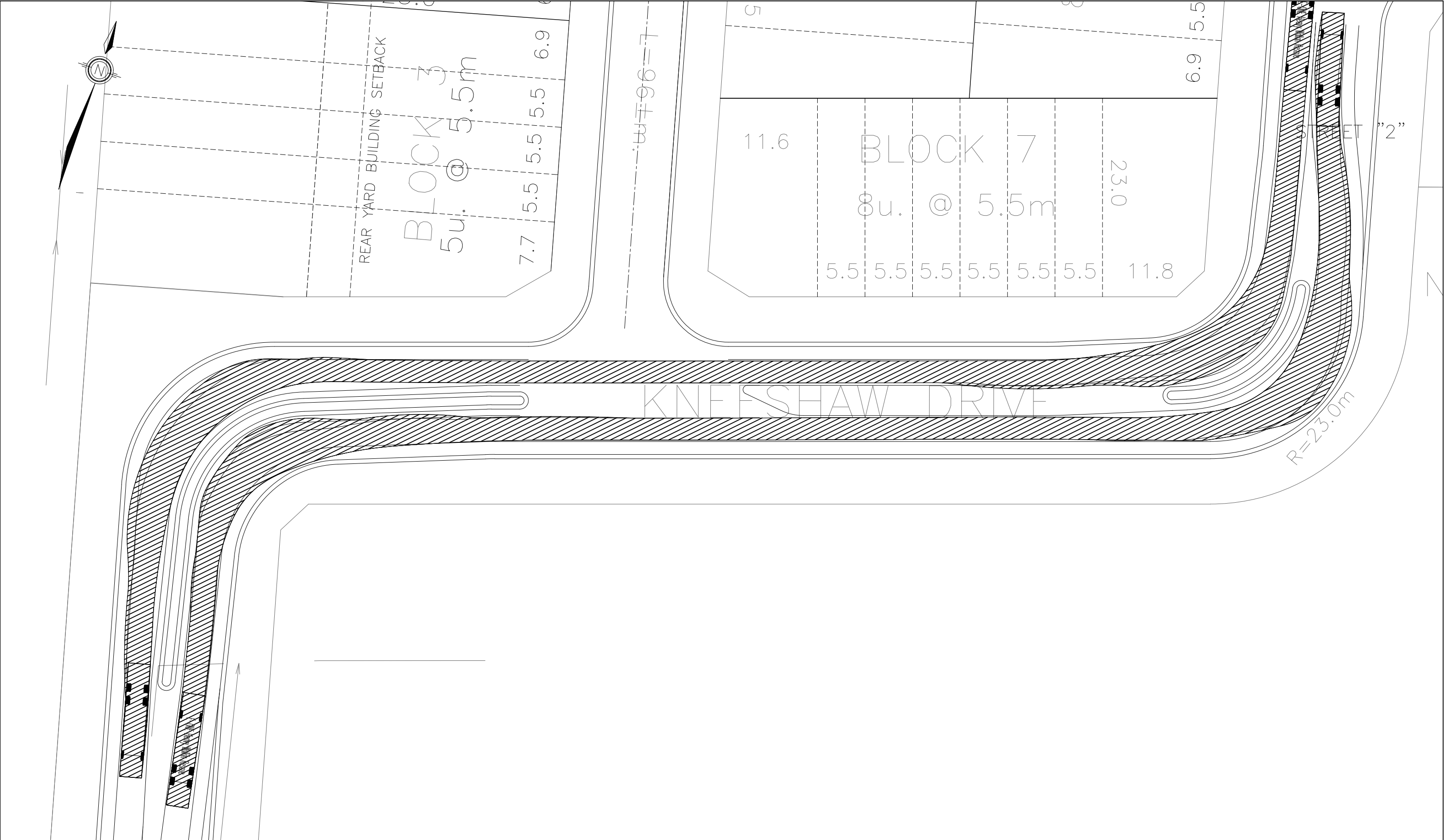
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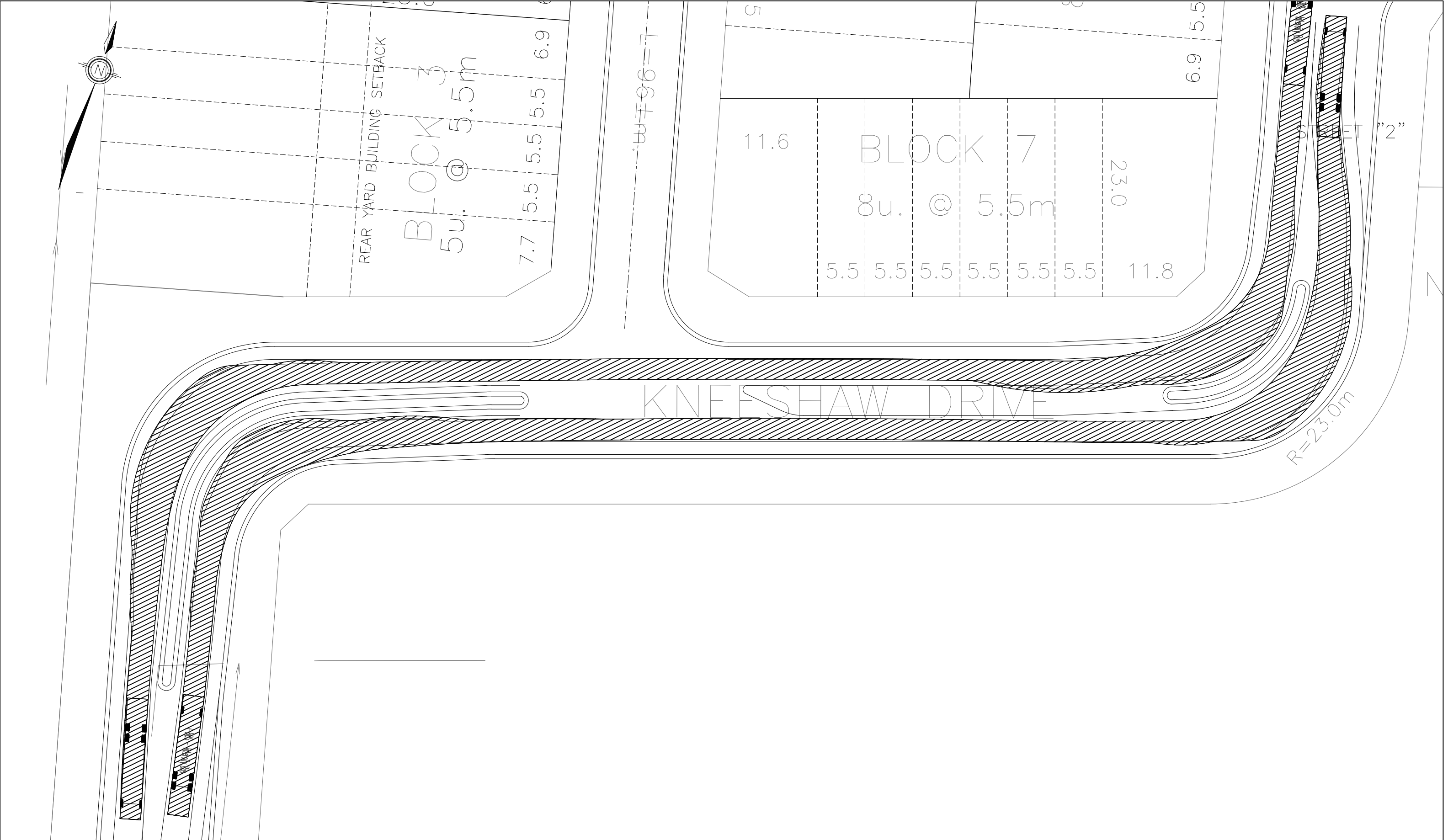


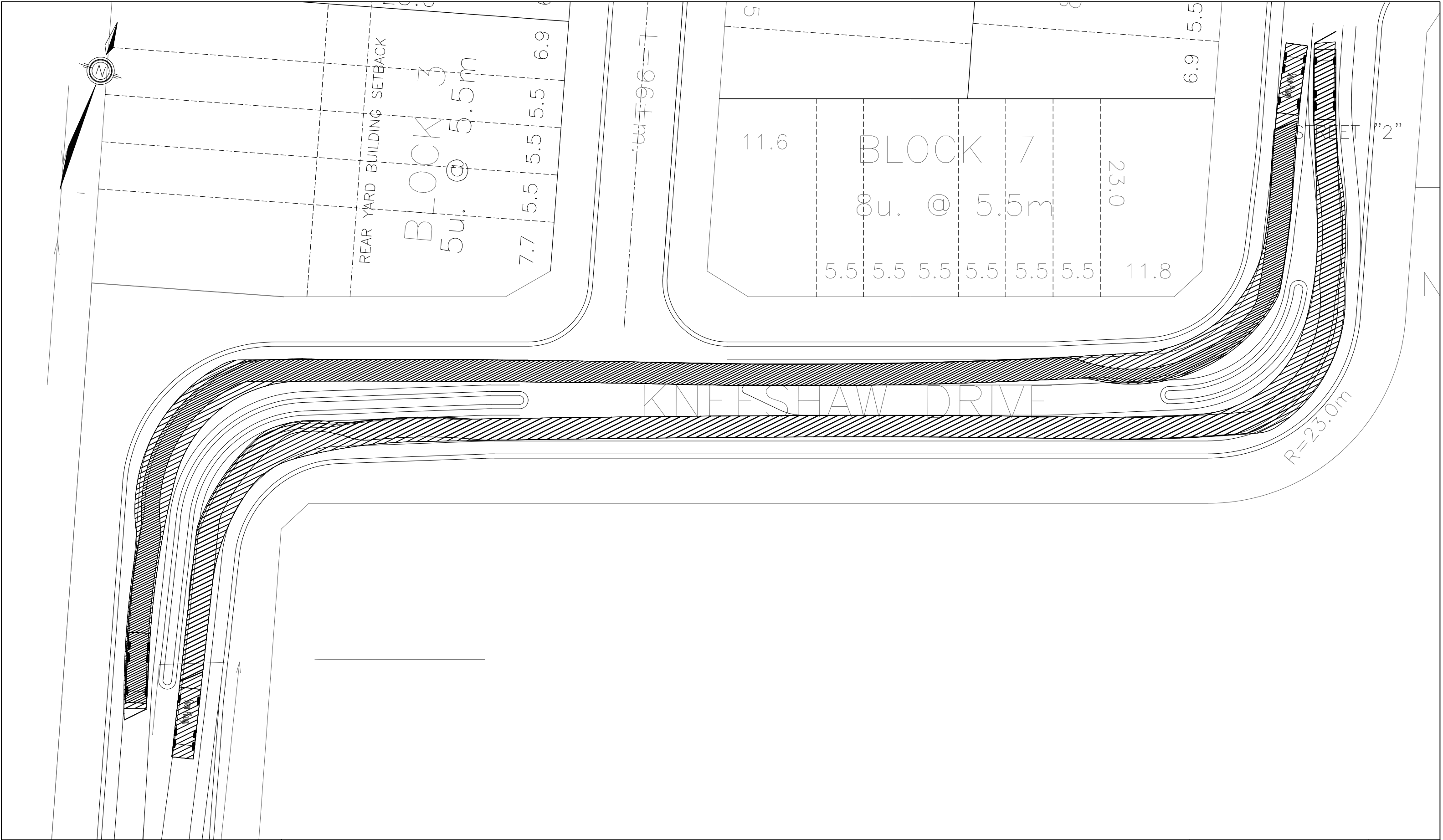






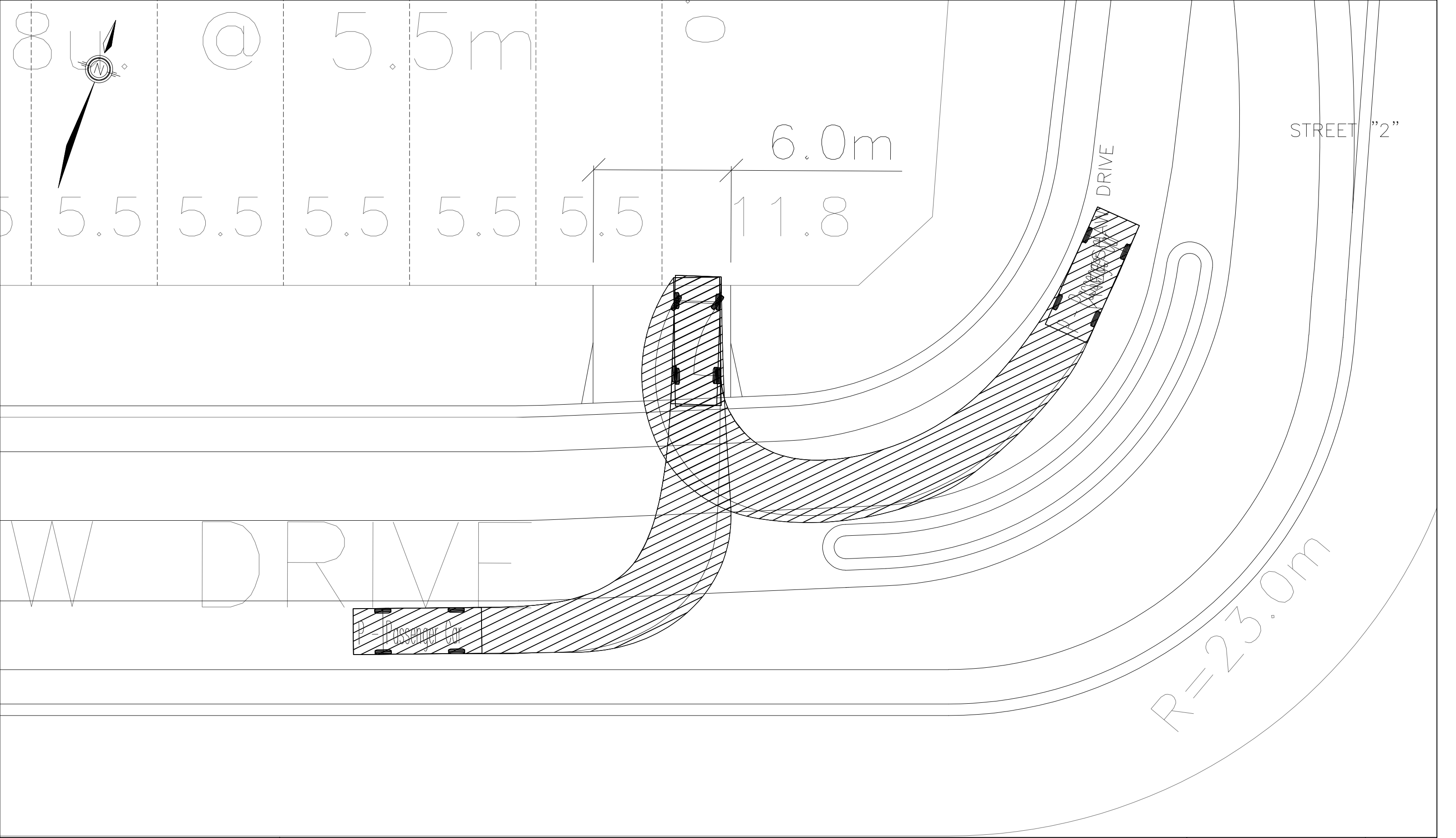






KNEE SHAW DRIVE RAISED CENTRE MEDIAN CONCEPTUAL DESIGN
SNOW PLOUGH

SCALE: 1 : 400		PROJECT No.
DATE: NOVEMBER 2019		17163
DESIGNED BY: S.R.	DRAWN BY: S.R.	FIGURE No. VMD-13
CHECKED BY: M.D.	CHECKED BY: M.D.	



TRAFFIC SIGNAL WARRANT ANALYSIS FORM FOR INTERSECTION CONTROL.

Traffic Signal Justification 7 - Projected Volumes - Traffic Impact Studies (page 88 OTM Book 12)

2031 Total

Major street : Lockhart Road

No. of lanes : 1

Minor street : Kneeshaw Drive

FREE FLOW CONDITIONS (RURAL)

☒

IS THIS A T - INTERSECTION

YES

☒

NO

☐

IS THIS AN EXISTING INTERSECTION

YES

☐

NO

☒

IS THIS A NEW INTERSECTION

YES

☒

NO

☐

JUSTIFICATION 1 - MINIMUM VEHICULAR VOLUME

100 % SATISFIED - YES

☐

NO

☒

80 % SATISFIED - YES

☐

NO

☒

		MINIMUM REQUIREMENTS Justification Increased by 50%				PERCENTAGE WARRANT		
APPROACH LANES		1		2 or MORE				
FLOW CONDITION		FREE FLOW ☒	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	AVERAGE HOURLY VOLUME		
		720	0	0	0	721		
A.	ALL APPROACHES	100% FULFILLED				100		
		80% FULFILLED				100		
		ACTUAL % IF BELOW 80% VALUE				0		
						0		
						TOTAL DOWN	100 / 1 =	100
Justification Increased by 50%								
B.	MINOR STREET BOTH APPROACHES*	270	0	0	0	135		TOTAL ACROSS
		100% FULFILLED				100		
		80% FULFILLED				100		
		ACTUAL % IF BELOW 80% VALUE				50		
						TOTAL DOWN	50 / 1 =	50

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

100 % SATISFIED - YES

☐

NO

☒

80 % SATISFIED - YES

☐

NO

☒

		MINIMUM REQUIREMENTS Justification Increased by 50%				PERCENTAGE WARRANT			
APPROACH LANES		1		2 or MORE					
FLOW CONDITION		FREE FLOW ☒	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	AVERAGE HOURLY VOLUME			
		720	0	0	0	662			
A.	MAJOR STREET BOTH APPROACHES	100% FULFILLED				0		SECTIONAL PERCENT	
		80% FULFILLED				80			
		ACTUAL % IF BELOW 80% VALUE				0			
						TOTAL DOWN			
						80 / 1 =		80	
Justification Increased by 50%									
B.	TRAFFIC CROSSING MAJOR STREET	75	0	0	0	1		TOTAL ACROSS	SECTIONAL PERCENT
		100% FULFILLED				0			
		80% FULFILLED				0			
		ACTUAL % IF BELOW 80% VALUE				1			
						TOTAL DOWN		1 / 1 =	1

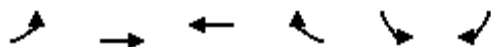
NOTES:

- The warrant values are based on annual average daily traffic (AADT) which approximates May and October traffic
- For warrants 1, 2, 3 and 4, each hourly volume must exceed the minimum requirements for the warrant to be 100% satisfied
- For warrant 5 the 8 hour average must exceed the minimum requirements for the warrant to be 100% satisfied
- The crossing volume is defined as the sum of:
 - Left turns from both minor street approaches
 - The heaviest through volume from the minor street
 - 50% of the heavier left turn movement from major street when both of the following criteria are met:
 - The left turn volume > 120 vph
 - The left turn volume plus the opposing volume > 720 vph
 - Pedestrians crossing the major street

HCM Signalized Intersection Capacity Analysis

1: Lockhart Road & Kneeshaw Drive

<2031 Total> AM Peak Hour

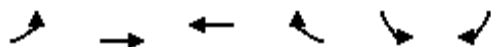


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	61	246	654	3	1	268
Future Volume (vph)	61	246	654	3	1	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frt	1.00	1.00	1.00		0.87	
Flt Protected	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1770	3539	3537		1612	
Flt Permitted	0.31	1.00	1.00		1.00	
Satd. Flow (perm)	578	3539	3537		1612	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	267	711	3	1	291
RTOR Reduction (vph)	0	0	1	0	49	0
Lane Group Flow (vph)	66	267	713	0	243	0
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	14.9	14.9	14.9		21.1	
Effective Green, g (s)	14.9	14.9	14.9		21.1	
Actuated g/C Ratio	0.31	0.31	0.31		0.44	
Clearance Time (s)	6.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	179	1098	1097		708	
v/s Ratio Prot		0.08	c0.20			
v/s Ratio Perm	0.11				c0.15	
v/c Ratio	0.37	0.24	0.65		0.34	
Uniform Delay, d1	12.9	12.3	14.3		8.9	
Progression Factor	1.00	1.00	1.00		1.00	
Incremental Delay, d2	1.3	0.1	1.4		1.3	
Delay (s)	14.2	12.5	15.7		10.2	
Level of Service	B	B	B		B	
Approach Delay (s)		12.8	15.7		10.2	
Approach LOS		B	B		B	
Intersection Summary						
HCM 2000 Control Delay			13.8		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			48.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			54.0%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

1: Lockhart Road & Kneeshaw Drive

<2031 Total> PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	289	640	389	6	2	115
Future Volume (vph)	289	640	389	6	2	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frt	1.00	1.00	1.00		0.87	
Flt Protected	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1770	3539	3531		1614	
Flt Permitted	0.50	1.00	1.00		1.00	
Satd. Flow (perm)	934	3539	3531		1614	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	314	696	423	7	2	125
RTOR Reduction (vph)	0	0	3	0	77	0
Lane Group Flow (vph)	314	696	427	0	50	0
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	17.5	17.5	17.5		18.5	
Effective Green, g (s)	17.5	17.5	17.5		18.5	
Actuated g/C Ratio	0.36	0.36	0.36		0.39	
Clearance Time (s)	6.0	6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	340	1290	1287		622	
v/s Ratio Prot		0.20	0.12			
v/s Ratio Perm	c0.34				c0.03	
v/c Ratio	0.92	0.54	0.33		0.08	
Uniform Delay, d1	14.6	12.1	11.0		9.4	
Progression Factor	1.00	1.00	1.00		1.00	
Incremental Delay, d2	29.9	0.4	0.2		0.3	
Delay (s)	44.5	12.5	11.2		9.6	
Level of Service	D	B	B		A	
Approach Delay (s)		22.4	11.2		9.6	
Approach LOS		C	B		A	
Intersection Summary						
HCM 2000 Control Delay			18.3		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.49			
Actuated Cycle Length (s)			48.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			49.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Queuing and Blocking Report
<2031 Total> AM Peak Hour

11-14-2019

Intersection: 1: Lockhart Road & Kneeshaw Drive

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (m)	28.4	28.6	20.7	48.4	45.0	35.1
Average Queue (m)	11.9	16.8	9.1	29.2	26.4	18.4
95th Queue (m)	22.9	26.3	18.8	42.7	40.5	32.2
Link Distance (m)		430.5	430.5	535.6	535.6	189.3
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	0	0				
Queuing Penalty (veh)	0	0				

Queuing and Blocking Report
<2031 Total> PM Peak Hour

11-14-2019

Intersection: 1: Lockhart Road & Kneeshaw Drive

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (m)	69.7	101.9	81.3	39.7	35.5	23.6
Average Queue (m)	44.3	37.7	28.8	19.6	15.4	10.1
95th Queue (m)	68.8	78.3	59.8	30.9	28.6	18.9
Link Distance (m)		430.5	430.5	535.6	535.6	189.3
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	37	3				
Queuing Penalty (veh)	118	8				