ReidMiddleton

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M E M O R A N D U M

To: Neil Jensen, Project Manager – City of Shoreline

From: Charles Smith, P.E.

Date: August 23, 2023

File No.: 252023.001

Subject: NW Innis Arden Way, Greenwood Ave N, & NE 160th ST Intersection Improvements

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This memorandum provides a summary of Reid Middleton's alternatives analysis for a roundabout at NW Innis Arden Way, Greenwood Ave N, & NE 160th ST. This memorandum and attached materials summarize the existing conditions of NW Innis Arden Way, Greenwood Ave N, & NE 160th ST, describe the developed alternatives, and recommend the preferred alternative for improvements to the intersection and access to Highland Terrace Elementary School and Shoreline Community College.

Background

Reid Middleton was contracted by the City of Shoreline to provide design services for a roundabout at the intersection of NW Innis Arden Way, Greenwood Ave N, & NE 160th ST. The intersection had previously been analyzed and roundabout options developed to solicit public feedback and determine the preferred layout of the intersection. Our efforts have taken the work that was previously done and further refined the options for a compact urban roundabout at this location. The following summarizes the preliminary design process used to develop and compare layout options for the intersection improvements. Exhibits and attachments further detail the impacts associated with the two alternatives considered: an oval-design single lane roundabout and a peanut-shaped single lane roundabout.

The design criteria and constraints are the same as those presented in the 2019 Concept Design Comparison Report and are included in Table 1.

Table 1: Design Criteria and Constraints

Design Speed	35 miles per hour (mph) approach, 20 mph for RAB
Design Vehicle	60-foot articulated KC Metro bus
Classification	Collector arterial
Right-of-Way	Avoid right-of-way (ROW) acquisition from residential properties east and south of the intersection
Engineering Standards	Shoreline Engineering Development Manual (EDM)
Stormwater Manual	Shoreline EDM, 2019 Deptartment of Ecology Stormwater Management Manual for Western Washington (SMMWW)

Existing Conditions

The project area consists of two closely spaced intersections near the entrance to Shoreline Community College (SCC). The project includes the intersection of N. 160th Street and Greenwood Avenue N, and the intersection of Greenwood Avenue N and NW Innis Arden Way. These stop-controlled intersections connect SCC, Highland Terrace Elementary School, and the surrounding residential areas to regional commercial areas along State Route 99. All legs of the intersections are collector arterials and experience significant backups during morning and afternoon peak hours. The intersections include crosswalks and sidewalks, and the future condition will include bike lanes along N 160th Street. The north and west portion of the project area is abutted by Highland Terrace Elementary, and SCC. The east and south of the project are bounded by residential parcels.

Traffic Analysis

Traffic analysis was completed for the roundabout alternatives developed during the feasibility study. Evaluation of the intersection included traffic analysis of traffic operations under existing conditions as well as forecasted operations for the year 2040. For the purposes of comparing the revised layouts for the oval and peanut options a Sidra analysis was performed for each option in order to compare overall traffic operations for each option. Both options function similarly and there are no significant differences between the oval and peanut alternatives and either option will function similar to the alternatives analyzed by Fehr & Peers as part of the 2019 Traffic Operations Alternatives Analysis.

Alternatives Analyses

In general, there are several benefits to a single lane roundabout when compared with signalized and stop controlled options for the project area. The frequency and severity of collisions statistically decline compared to a typical intersection, and traffic will experience less delay while continuing to accommodate buses and large vehicles. In addition to the noted benefits at NW Innis Arden Way, Greenwood Ave N, & NE 160th ST the construction of a roundabout will provide safe access to Highland Terrace Elementary School and Shoreline Community College.

In addition to the operational analysis of the intersection several other factors were considered. These other areas of concern included safety, required Right-of-Way, stormwater impacts from new impervious areas, multimodal impacts (mainly bikes and pedestrians), and any environmental impacts to be considered. A copy of the decision matrix and alternatives for the analysis can be found in the **Appendix**. Planning level cost estimates are also included.

Roundabout Design Options

The two roundabout layouts that were developed for this alternatives analysis are the Oval single lane roundabout and an updated layout from the 2019 preferred alternative that we are calling the Peanut Roundabout.

Option 1 – Oval Roundabout

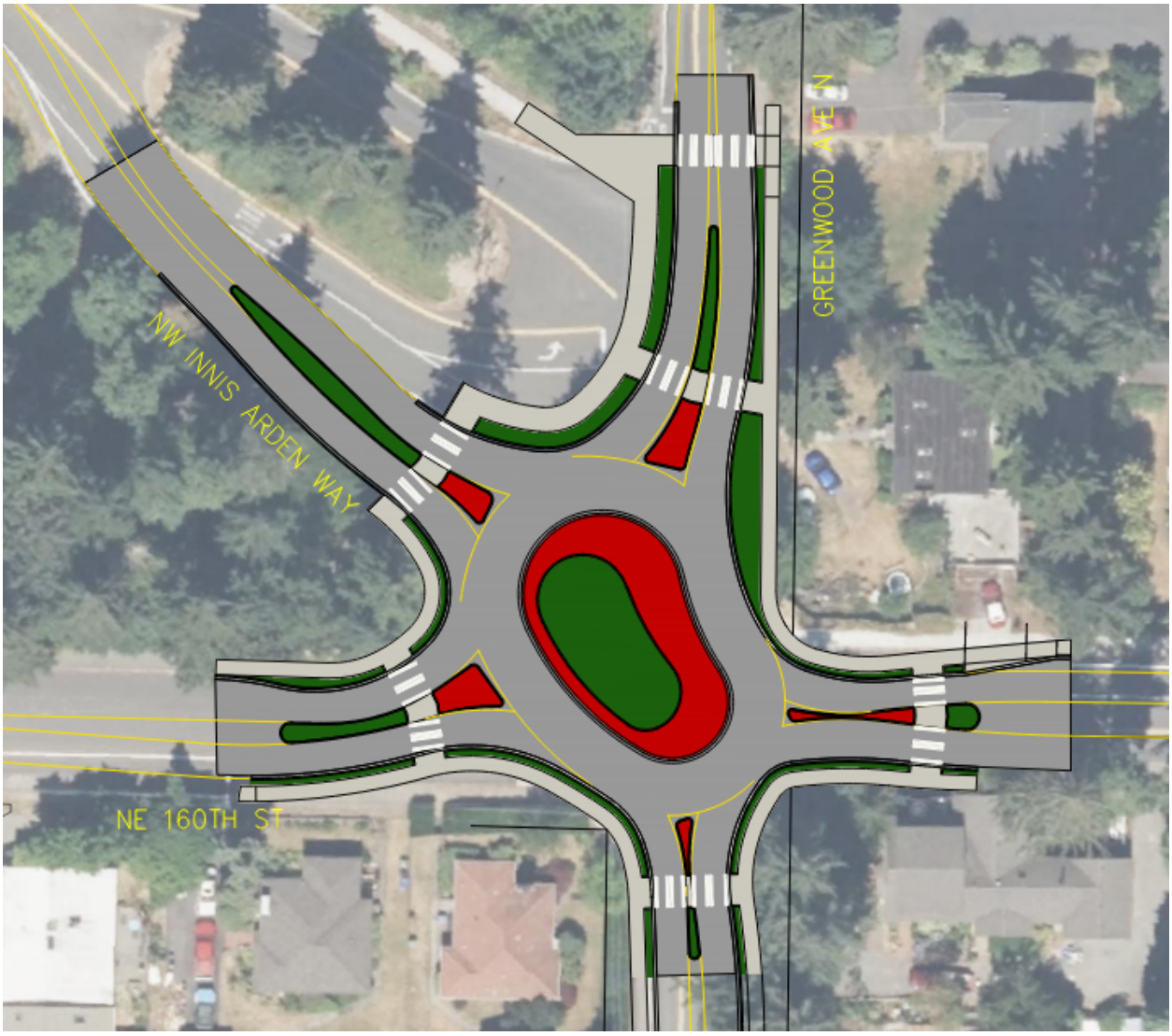

FIGURE 1 – OVAL ROUNDABOUT

The Oval Roundabout option was initially developed as part of the RFQ for this project. The features are similar to the peanut option in that it combines the operations of the intersections of NE 160th Street/Greenwood Avenue and Innis Arden Way/Greenwood Avenue into a single lane roundabout. The oval layout provides an even more compact design than the peanut option while maintaining the five-leg connection to the adjacent streets.

Option 2 – Peanut Roundabout

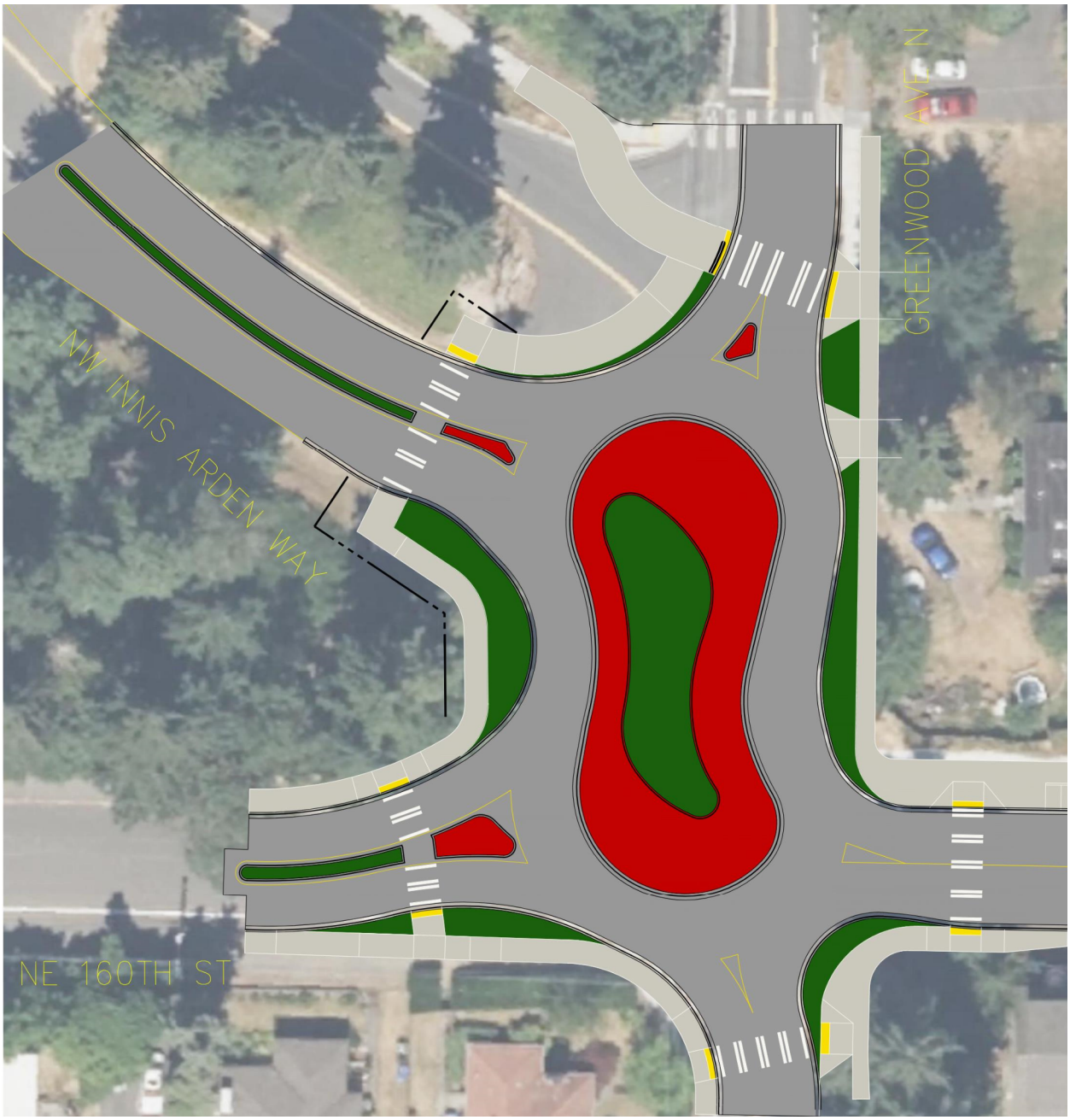

FIGURE 2 – PEANUT ROUNDABOUT

The Peanut Roundabout option shown is an updated version of the preferred alternative presented in the 2019 Concept Design and Comparison Report. There are minor updates to the 2019 conceptual layout. The primary modifications are to the center island and truck apron. The right of way constraints in the southeast area of the project significantly limits the ability to provide splitter islands and entry curve

geometry for northbound and westbound traffic. There is a possibility that northbound traffic from Greenwood Avenue may try to cut the corner and go left directly to westbound N. 160th Street.

Preferred Alternative

The Oval design has slightly improved operations as compared to the Peanut option. The main differentiator when comparing the two options is the improved entry alignments for the southeast portion of the intersection. The Oval design allows for raised splitter islands on all legs of the intersection and provides slower entry and circulating speeds based on fastest path analysis. The slightly smaller footprint offers a slight reduction in projected construction costs as well.

Another intrinsic benefit of the compact Oval design is the additional area beyond the proposed back of walk that could be used for landscaping, stormwater features, etc. There could be benefits to the community from the additional open space available for future improvements and amenities.

Other Items to Consider

The following topics are elements of the design that the City should be aware of. These items are not determining factors for the selection of the preferred alternative.

Utilities – there will be significant impacts to the existing utilities within the project area. The roundabout improvements may require relocation of one or more existing utility poles to accommodate the intersection improvements.

Grading for N 160th Street – the existing profile of N 160th Street east of Greenwood Avenue is relatively abrupt. The preliminary profile information is shown below. The profile can be adjusted to provide a smooth transition into and out of the roundabout but may require walls and/or replacement of the driveway at 315 N 160th Street. The driveway is not connected to a garage but is currently used for parking.

Driveway for 16006 Greenwood Avenue – the driveway immediately north of N 160th Street currently provides access to the back of the 315 N 160th Street property. This driveway is at the location of the proposed crosswalk for the Oval option. This driveway could be removed. Another option would be to eliminate the crosswalk at this location and/or shift it further north to avoid the driveway.

Overlay – there is a significant portion of the intersection that can be constructed without a full removal and replacement of the pavement section. These areas do not require regrading and can utilize the existing grade to reduce the construction costs. These overlay areas are shown in exhibits included in the appendix.

Appendix

- **Exhibits**
  - Concept Layout for Oval Roundabout
  - Right-of-Way Impacts for Oval Roundabout
  - New Impervious Areas for Oval Roundabout
  - Overlay Areas for Oval Roundabout
  - Planning Level Costs for Oval
  - Concept Layout for Peanut Roundabout
  - Right-of-Way Impacts for Peanut Roundabout
  - New Impervious Areas for Peanut Roundabout
  - Overlay Areas for Peanut Roundabout
  - Planning Level Costs for Peanut
  - Decision Matrix Summary
  - Traffic Operations - Sidra Comparison Data

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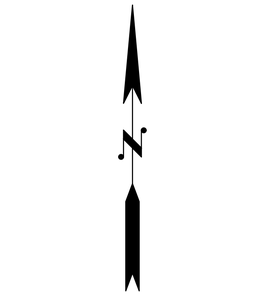
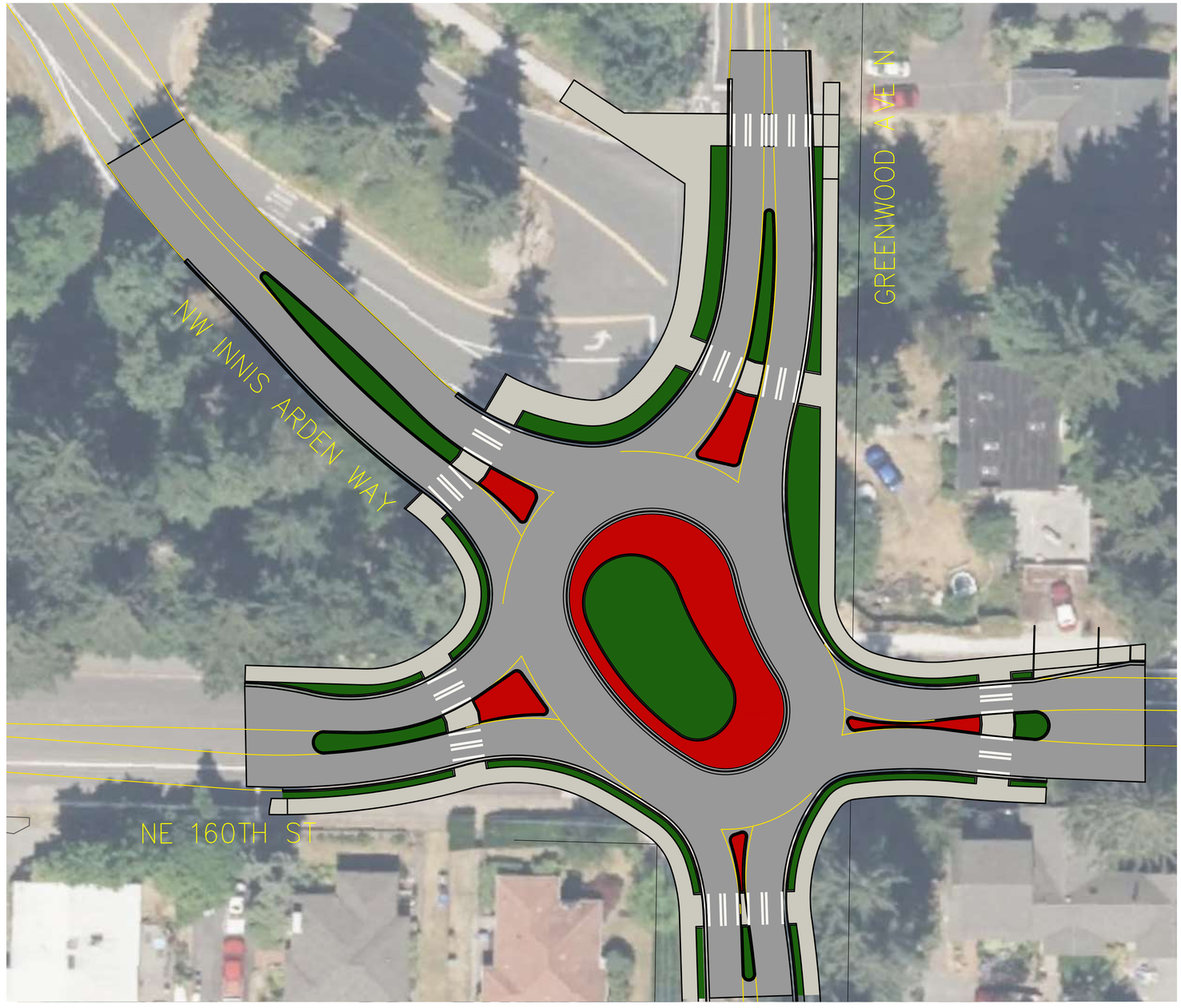
APPENDIX

Exhibits

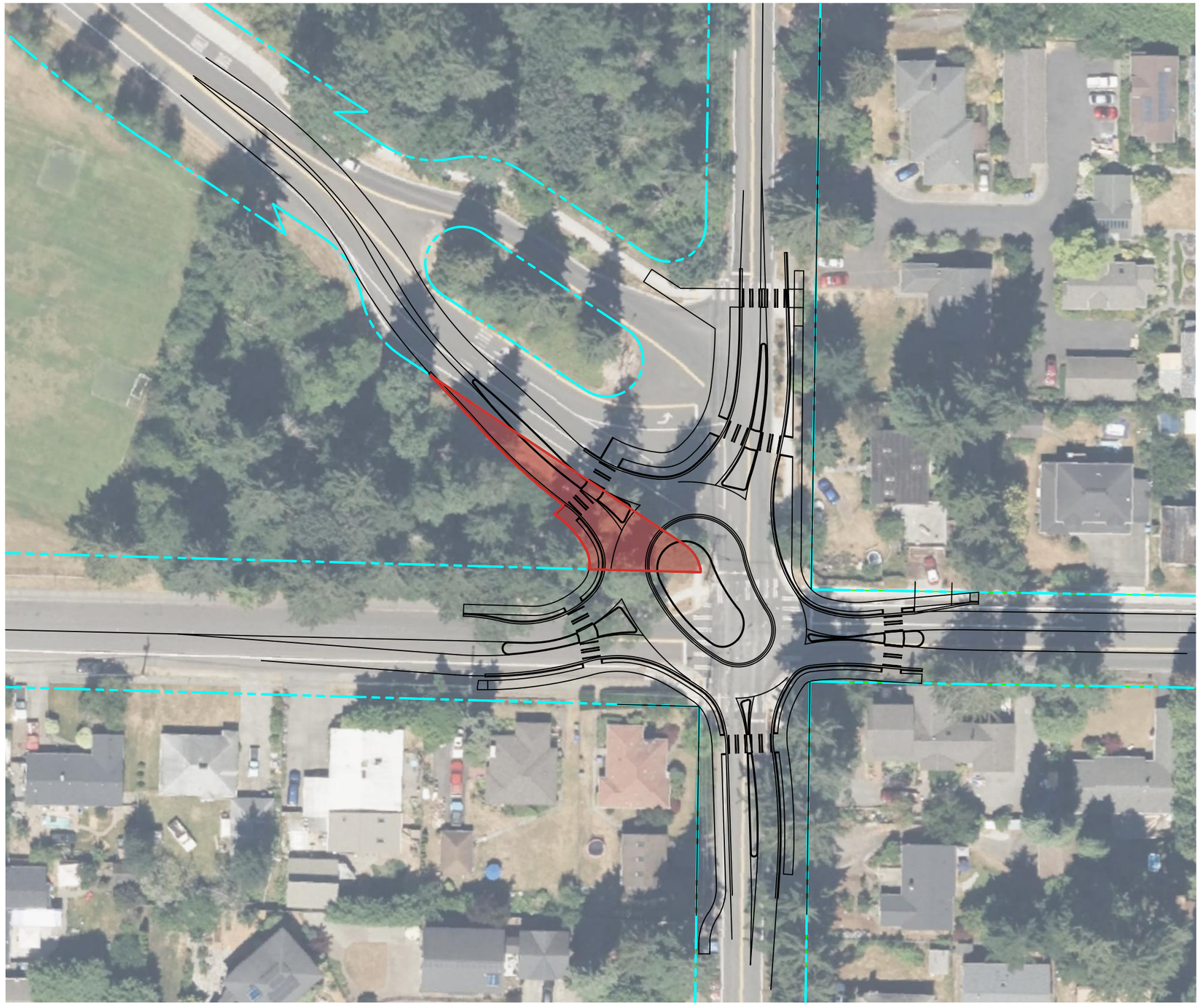


LEGEND:

	PROPOSED ASPHALT PAVEMENT =	20,020 SF
	PROPOSED CONCRETE SIDEWALK =	5,820 SF
	TRUCK APRON =	2,530 SF
	PROPOSED LANDSCAPE AREAS =	4,560 SF
	LENGTH OF CEMENT CONCRETE CURB =	2,060 LF



PROPOSED AREAS - OVAL ROUNDABOUT



N

SCALE IN FEET

30 0 30 60

LEGEND:

ROW IMPACTS = 3,170 SF

ROW IMPACTS - OVAL DESIGN

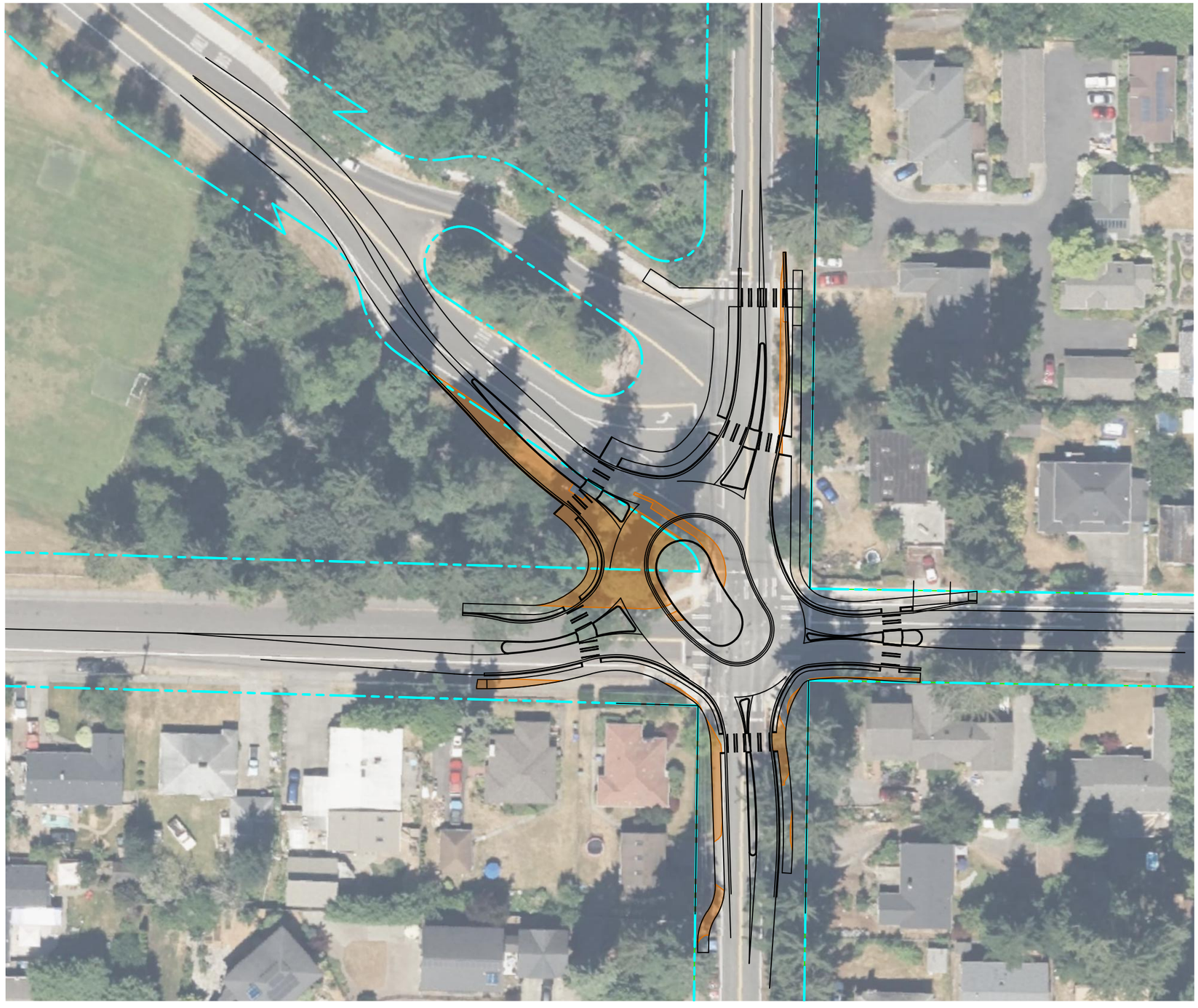
N

SCALE IN FEET

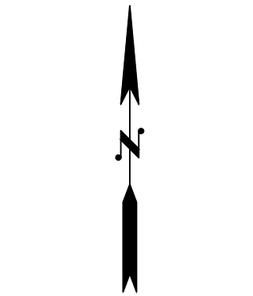
30 0 30 60

LEGEND:

NEW IMPERVIOUS AREA REQUIRED = 5,295 SF

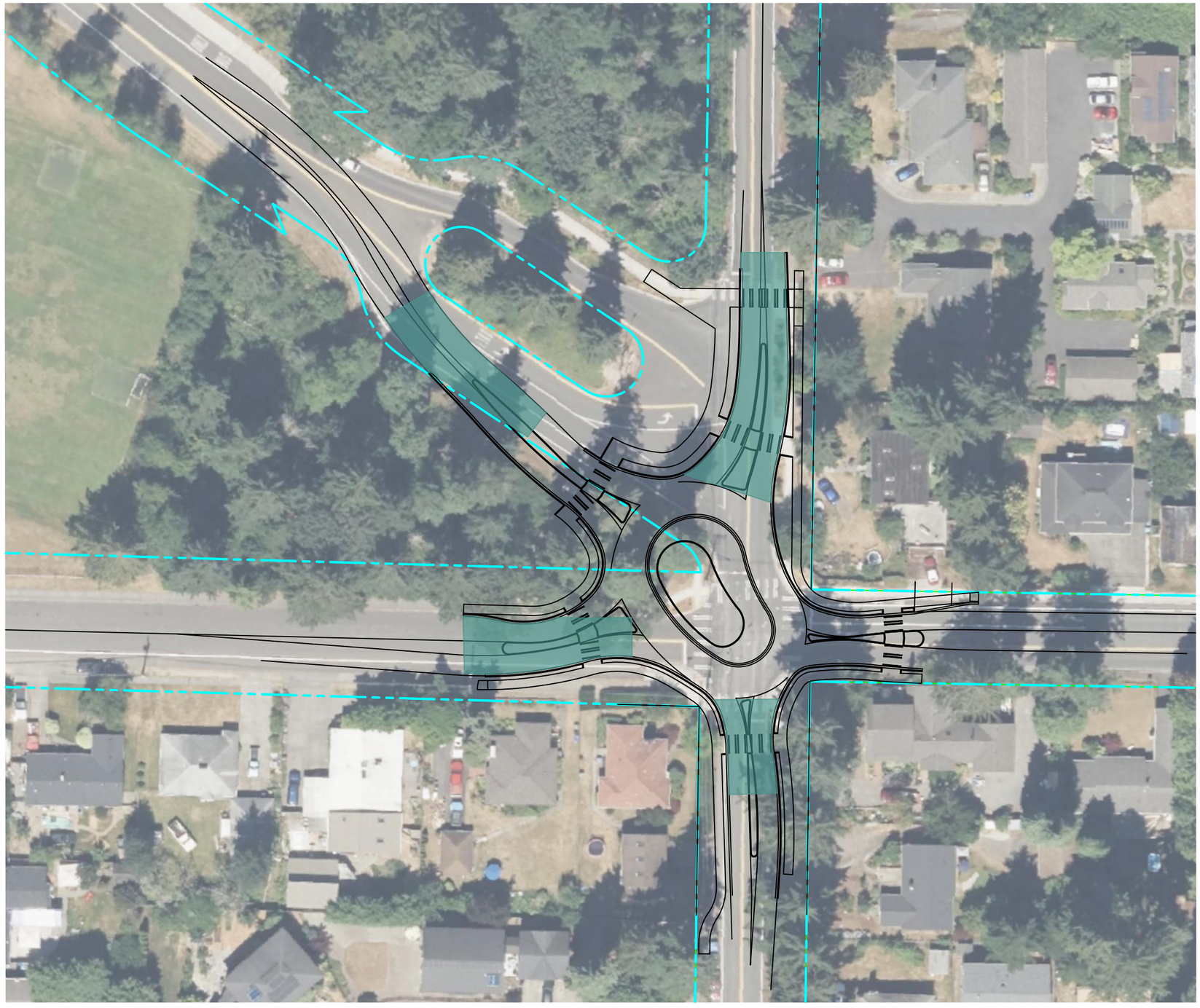


NEW IMPERVIOUS AREA REQUIRED - OVAL DESIGN



LEGEND:

OVERLAY AREA = 9,695 SF



OVERLAY AREAS - OVAL DESIGN

City of Shoreline

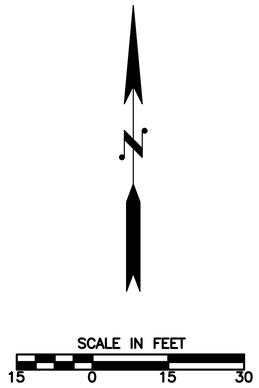
160th & Greenwood Roundabout

Oval Concept

Preliminary Opinion of Probable Construction Cost

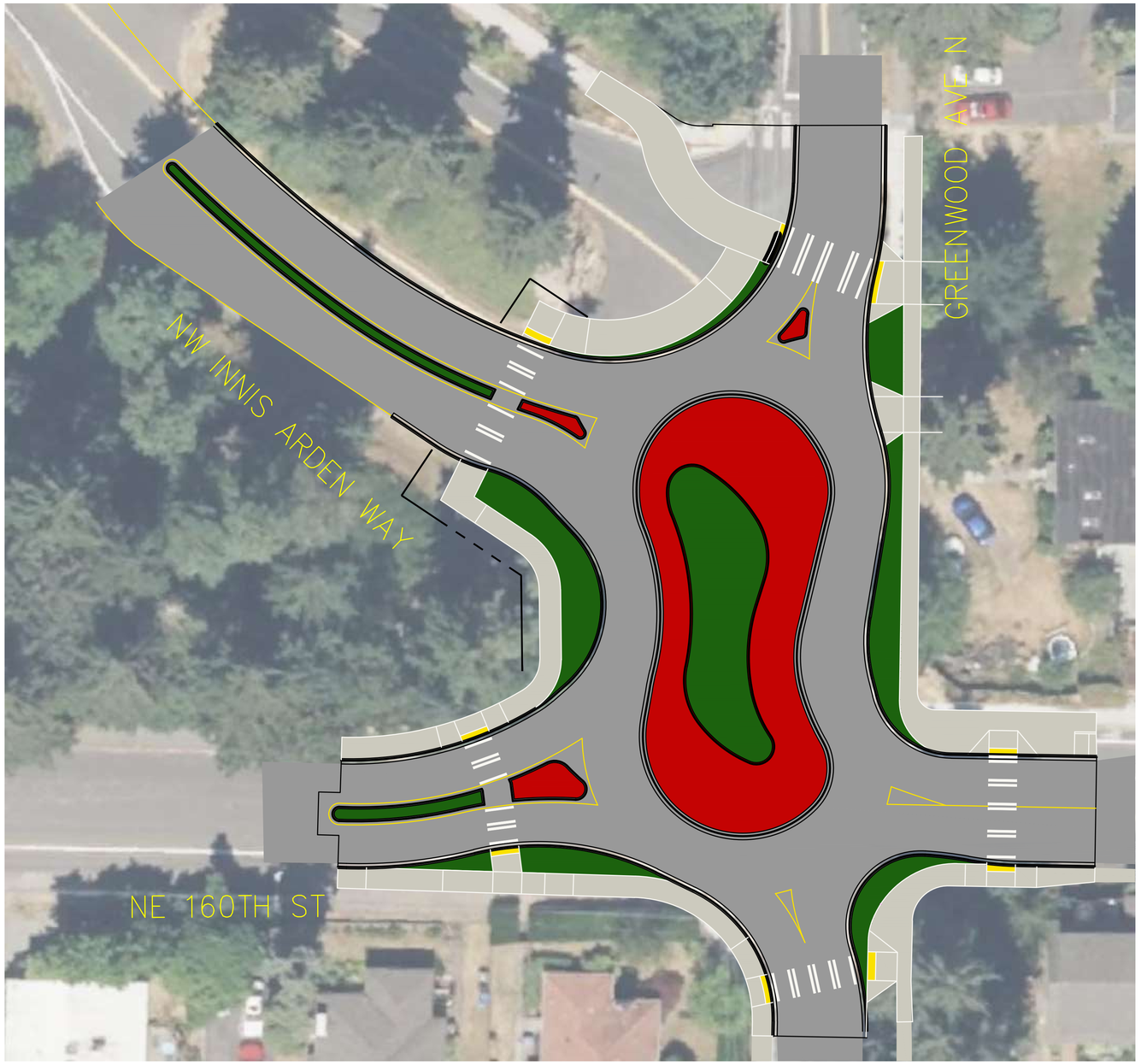
Quantifiable Items	QTY	UNIT
Roadway Pavement	20,100	SF
Landscaped Area	4,600	SF
Cement Concrete Sidewalk	5,900	SF
Cement Conc. Curb	2,100	LF
Truck Apron	2,600	SF

ITEM	QTY	UNIT	UNIT COST	COST
PREPARATION				
Mobilization	1	LS	$230,000	$230,000
Construction Surveying	1	LS	$50,000	$50,000
Clearing & Grubbing	0.3	AC	$50,000	$15,000
TRAFFIC CONTROL				
Traffic Control	1	LS	$200,000	$200,000
ROADWAY PREPARATION				
Roadway Excavation Incl. Haul	1,600	CY	$50	$80,000
Gravel Borrow	1,100	TN	$45	$49,500
ROADWAY SECTION				
HMA Cl. 1/2 in. PG 58H-22	800	TN	$150	$120,000
Crushed Surfacing Base Course	1,000	TN	$50	$50,000
CONCRETE PAVING				
Cement Concrete Paving	300	SY	$350	$105,000
Crushed Surfacing Base Course	200	TN	$50	$10,000
STORM DRAINAGE				
Stormwater Improvements	1	LS	$150,000	$150,000
EROSION CONTROL				
TESC	1	LS	$70,000	$70,000
CURBING				
Cement Conc. Curbs	2,100	LF	$90	$189,000
STRIPING & SIGNING				
Channelization and Signing	1	LS	$80,000	$80,000
ILLUMINATION				
Illumination System	1	LS	$120,000	$120,000
SIDEWALK & RAMPS				
Cement Conc. Sidewalk	700	SY	$120	$84,000
Cement Concrete Curb Ramps	12	EA	$4,000	$48,000
OTHER ITEMS				
Landscaping	1	LS	$75,000	$75,000
Miscellaneous/Unknown Costs	1	LS	$150,000	$150,000
Utility and Grading Adjustments	1	LS	$100,000	$100,000
			Subtotal	$1,980,000
			Contingency (15%)	$300,000
			Total	**$2,280,000**

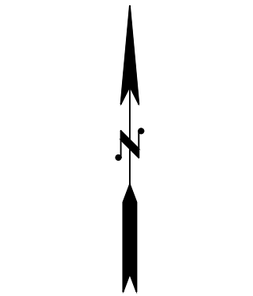


LEGEND:

	PROPOSED ASPHALT PAVEMENT =	21,080 SF
	PROPOSED CONCRETE SIDEWALK =	5,750 SF
	TRUCK APRON =	3,910 SF
	PROPOSED LANDSCAPE AREAS =	3,740 SF
	LENGTH OF CEMENT CONCRETE CURB =	2,230 LF

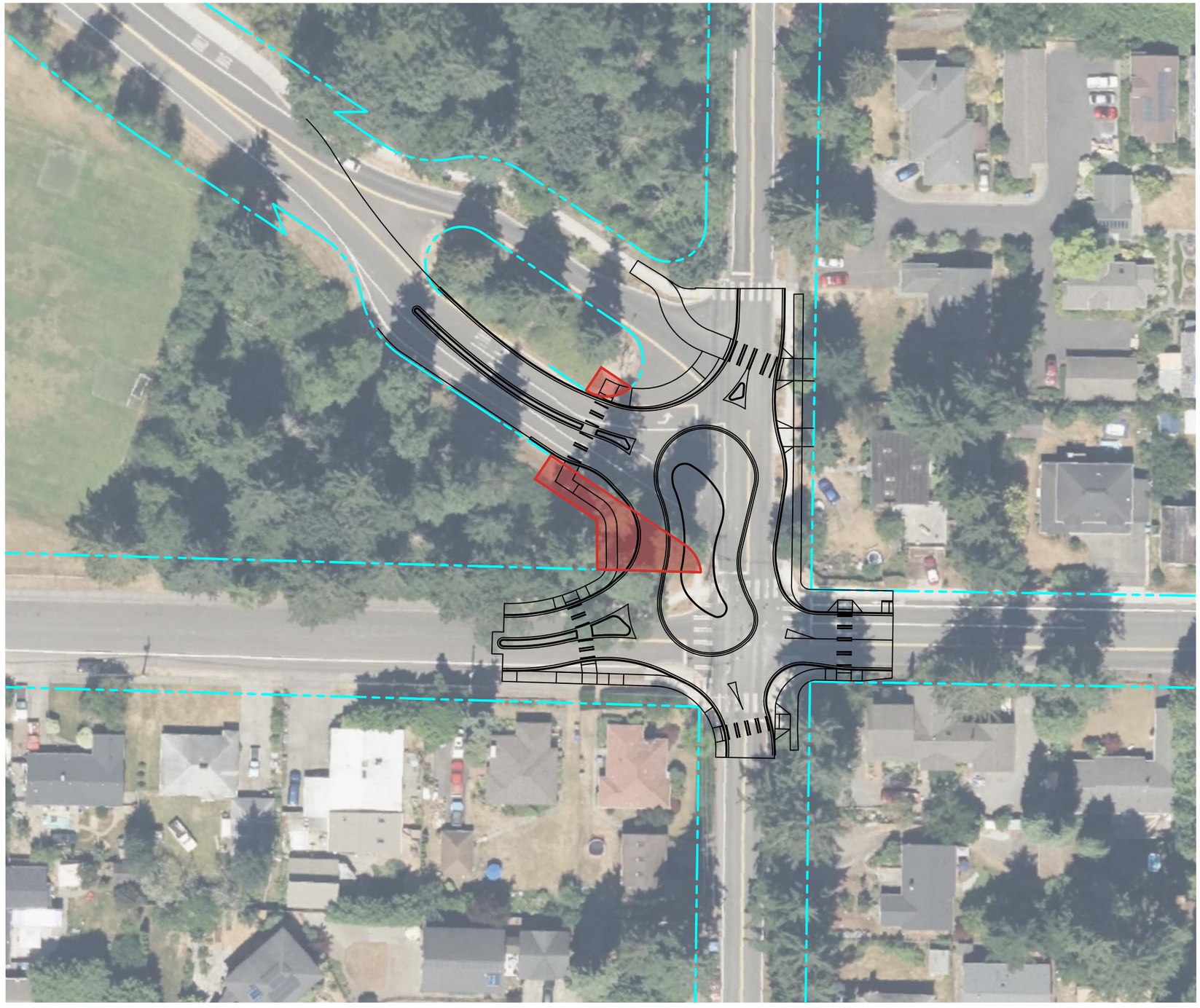


PROPOSED AREAS - PEANUT ROUNDABOUT

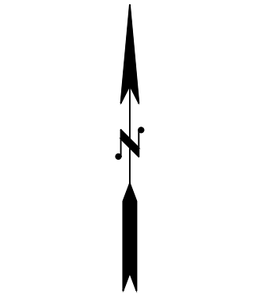


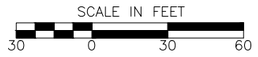
LEGEND:

ROW IMPACTS = 2,275 SF



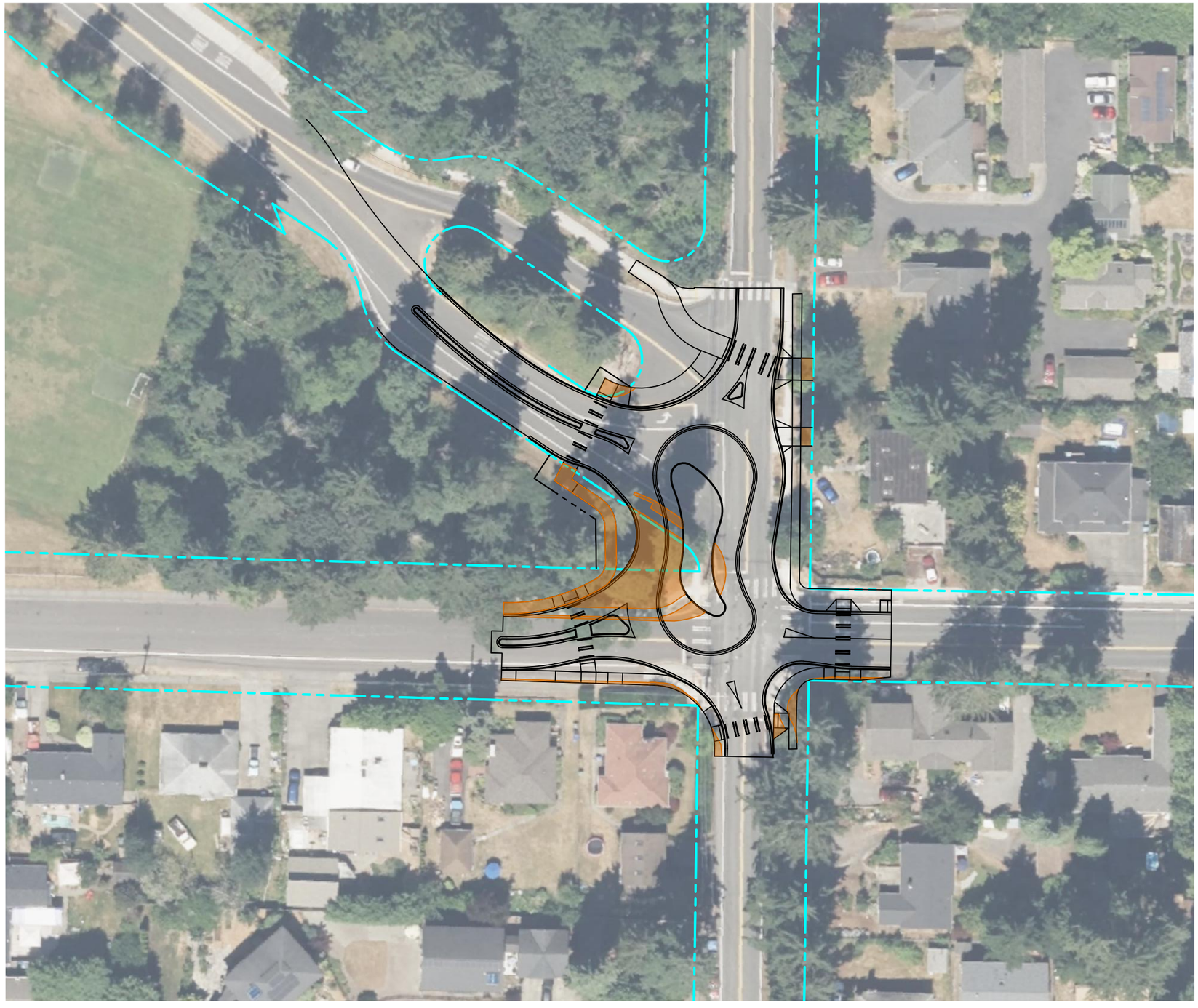
ROW IMPACTS -PEANUT DESIGN



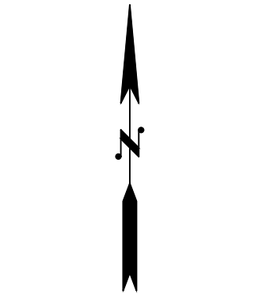


LEGEND:

NEW IMPERVIOUS AREA REQUIRED = 3,515 SF

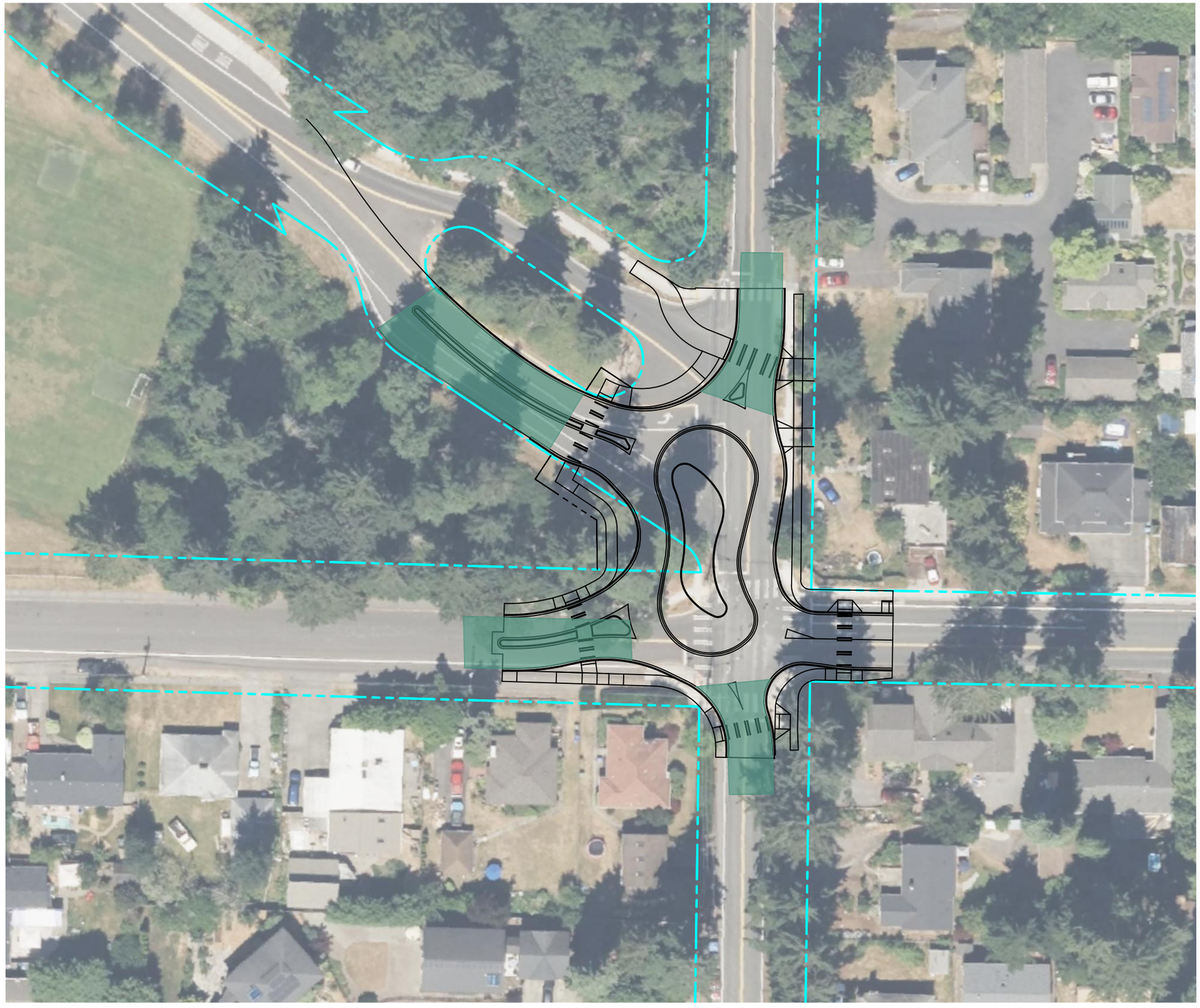


NEW IMPERVIOUS AREA REQUIRED - PEANUT DESIGN



LEGEND:

OVERLAY AREA = 9,735 SF



OVERLAY AREA - PEANUT DESIGN

City of Shoreline

160th & Greenwood Roundabout

Peanut Concept

Preliminary Opinion of Probable Construction Cost

Quantifiable Items	QTY	UNIT
Roadway Pavement	21,100	SF
Landscaped Area	3,800	SF
Cement Concrete Sidewalk	5,800	SF
Cement Conc. Curb	2,300	LF
Truck Apron	4,000	SF

ITEM	QTY	UNIT	UNIT COST	COST
PREPARATION				
Mobilization	1	LS	$230,000	$230,000
Construction Surveying	1	LS	$50,000	$50,000
Clearing & Grubbing	0.3	AC	$30,000	$9,000
TRAFFIC CONTROL				
Traffic Control	1	LS	$210,000	$210,000
ROADWAY PREPARATION				
Roadway Excavation Incl. Haul	1,600	CY	$50	$80,000
Gravel Borrow	1,200	TN	$45	$54,000
ROADWAY SECTION				
HMA Cl. 1/2 in. PG 58H-22	900	TN	$150	$135,000
Crushed Surfacing Base Course	1,000	TN	$50	$50,000
CONCRETE PAVING				
Cement Concrete Paving	500	SY	$350	$175,000
Crushed Surfacing Base Course	200	TN	$50	$10,000
STORM DRAINAGE				
Stormwater Improvements	1	LS	$110,000	$110,000
EROSION CONTROL				
TESC	1	LS	$70,000	$70,000
CURBING				
Cement Conc. Curbs	2,300	LF	$90	$207,000
STRIPING & SIGNING				
Channelization and Signing	1	LS	$80,000	$80,000
ILLUMINATION				
Illumination System	1	LS	$120,000	$120,000
SIDEWALK & RAMPS				
Cement Conc. Sidewalk	700	SY	$120	$84,000
Cement Concrete Curb Ramps	10	EA	$4,000	$40,000
OTHER ITEMS				
Landscaping	1	LS	$65,000	$65,000
Miscellaneous/Unknown Costs	1	LS	$160,000	$160,000
Utility and Grading Adjustments	1	LS	$100,000	$100,000
			Subtotal	$2,040,000
			Contingency (15%)	$310,000
			Total	**$2,350,000**

Several factors have been considered in addition to the traffic operations to evaluate the conceptual layout at the intersection of NW Innis Arden Way, Greenwood Ave N, and N 160th ST. All traffic operations information for the future configurations are for the AM Peak Hour for the design year 2040. The following table provides a summary of various criteria for the developed conceptual layouts. A preliminary Opinion of Probable Construction Costs (order of magnitude) for each of the alternatives is also included.

Decision Matrix - Alternatives Analysis

Alternative 1 – Oval Design Roundabout	Alternative 2 – Peanut Design Roundabout
Traffic Operations	
Improved overall operations compared to the peanut design. Average delay of 9.6 sec / veh during AM peak. Note: These LOS metrics are only for comparing these two alternatives and do not align with or replace the VISSIM analysis previously done for the project area.	Slight reduction in overall operations compared to the oval design. Average delay of 11.3 sec / veh during AM peak. Note: These LOS metrics are only for comparing these two alternatives and do not align with or replace the VISSIM analysis previously done for the project area.
Traffic Safety	
Oval design provides raised splitter islands for all legs of the intersection. Improved entry angles align drivers with intended vehicle paths.	Significant constraints on the east leg of N. 160th St. and south leg of Greenwood Ave N. do not allow for good splitter islands and entry curves.
Right-of-Way	
3,170 SF ROW Impacts All acquisition will be from the Shoreline School District. Temporary Construction Easements may be required.	2,275 SF ROW Impacts Slightly smaller footprint. Temporary Construction Easements may be required.
Stormwater Impacts	
5,295 SF New impervious Minor increase in impervious surfacing will require moderate stormwater mitigation, stormwater treatment, & flow control.	3,515 SF New Impervious Minimal increase to impervious surfacing.
Multimodal Impacts	
Reduced speeds with RAB's will enhance safety for bicycles, pedestrians, and bus routes for access to both Highland Terrace Elementary School and Shoreline Community College.	Same benefits
Miscellaneous	
The compact oval design provides additional open space behind the back of walk. This additional area could be used to reduce the paved footprint and provide landscaping or future open spaces that could be beneficial to the community.	Larger footprint of intersection layout reduces potential areas for future non-roadway benefits.
Construction Costs	
$1,900,000 - $2,300,000	$2,000,000 - $2,400,000

MOVEMENT SUMMARY

Site: 101 [160th & Greenwood Ear 2040 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: South Leg: Greenwood Ave N														
3	L2	20	3.0	20	3.0	0.380	10.6	LOS B	2.3	59.1	0.52	0.70	0.52	33.7
3a	L1	270	3.0	270	3.0	0.380	9.6	LOS A	2.3	59.1	0.52	0.70	0.52	33.5
8	T1	50	3.0	50	3.0	0.380	6.9	LOS A	2.3	59.1	0.52	0.70	0.52	33.8
18	R2	40	3.0	40	3.0	0.380	6.8	LOS A	2.3	59.1	0.52	0.70	0.52	33.2
Approach		380	3.0	380	3.0	0.380	9.0	LOS A	2.3	59.1	0.52	0.70	0.52	33.5
East: East Leg N 160th St														
1	L2	15	3.0	15	3.0	0.608	14.6	LOS B	5.9	150.2	0.82	0.88	0.96	33.1
6	T1	115	3.0	115	3.0	0.608	10.6	LOS B	5.9	150.2	0.82	0.88	0.96	33.3
16a	R1	320	3.0	320	3.0	0.608	10.2	LOS B	5.9	150.2	0.82	0.88	0.96	33.1
16	R2	55	3.0	55	3.0	0.608	10.6	LOS B	5.9	150.2	0.82	0.88	0.96	32.5
Approach		505	3.0	505	3.0	0.608	10.5	LOS B	5.9	150.2	0.82	0.88	0.96	33.1
North: North LEg Greenwood Ave N														
7	L2	55	3.0	55	3.0	0.388	14.2	LOS B	2.6	65.8	0.81	0.90	0.83	32.9
4	T1	95	3.0	95	3.0	0.388	10.1	LOS B	2.6	65.8	0.81	0.90	0.83	33.2
14	R2	20	3.0	20	3.0	0.388	9.9	LOS A	2.6	65.8	0.81	0.90	0.83	32.5
14b	R3	86	3.0	93	2.8	0.388	10.2	LOS B	2.6	65.8	0.81	0.90	0.83	32.3
Approach		256	3.0	263	2.9	0.388	11.0	LOS B	2.6	65.8	0.81	0.90	0.83	32.8
NorthWest: Innis Arden Way														
7bx	L3	25	3.0	25	3.0	0.271	11.5	LOS B	1.5	39.3	0.53	0.68	0.53	34.5
7ax	L1	80	3.0	80	3.0	0.271	9.7	LOS A	1.5	39.3	0.53	0.68	0.53	34.1
14ax	R1	135	3.0	135	3.0	0.271	6.2	LOS A	1.5	39.3	0.53	0.68	0.53	34.5
14bx	R3	25	3.0	25	3.0	0.271	6.8	LOS A	1.5	39.3	0.53	0.68	0.53	33.7
Approach		265	3.0	265	3.0	0.271	7.8	LOS A	1.5	39.3	0.53	0.68	0.53	34.3
West: West Leg N 160th St														
5b	L3	10	3.0	10	3.0	0.128	12.0	LOS B	0.7	17.4	0.55	0.66	0.55	34.3
5	L2	15	3.0	15	3.0	0.128	11.0	LOS B	0.7	17.4	0.55	0.66	0.55	34.1
2	T1	75	3.0	75	3.0	0.128	7.2	LOS A	0.7	17.4	0.55	0.66	0.55	34.4
12	R2	15	3.0	15	3.0	0.128	6.8	LOS A	0.7	17.4	0.55	0.66	0.55	33.8
Approach		115	3.0	115	3.0	0.128	8.1	LOS A	0.7	17.4	0.55	0.66	0.55	34.2
All Vehicles		1521	3.0	1528	3.0	0.608	9.6	LOS A	5.9	150.2	0.67	0.78	0.72	33.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: 101 [160th & Greenwood Peanut 2040 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: South Leg: Greenwood Ave N														
3	L2	20	3.0	20	3.0	0.338	10.1	LOS B	1.7	42.9	0.41	0.67	0.41	34.1
3a	L1	270	3.0	270	3.0	0.338	9.1	LOS A	1.7	42.9	0.41	0.67	0.41	33.9
8	T1	50	3.0	50	3.0	0.338	5.8	LOS A	1.7	42.9	0.41	0.67	0.41	34.3
18	R2	40	3.0	40	3.0	0.338	5.7	LOS A	1.7	42.9	0.41	0.67	0.41	33.5
Approach		380	3.0	380	3.0	0.338	8.4	LOS A	1.7	42.9	0.41	0.67	0.41	33.9
East: East Leg N 160th St														
1	L2	15	3.0	15	3.0	0.717	19.3	LOS B	8.6	221.1	0.92	1.04	1.25	31.2
6	T1	115	3.0	115	3.0	0.717	15.1	LOS B	8.6	221.1	0.92	1.04	1.25	31.3
16a	R1	320	3.0	320	3.0	0.717	14.7	LOS B	8.6	221.1	0.92	1.04	1.25	31.2
16	R2	55	3.0	55	3.0	0.717	14.8	LOS B	8.6	221.1	0.92	1.04	1.25	30.7
Approach		505	3.0	505	3.0	0.717	14.9	LOS B	8.6	221.1	0.92	1.04	1.25	31.2
North: North LEg Greenwood Ave N														
7	L2	55	3.0	55	3.0	0.459	17.4	LOS B	3.6	92.7	0.90	0.99	1.03	31.5
4	T1	95	3.0	95	3.0	0.459	13.2	LOS B	3.6	92.7	0.90	0.99	1.03	31.7
14	R2	20	3.0	20	3.0	0.459	13.0	LOS B	3.6	92.7	0.90	0.99	1.03	31.1
14b	R3	86	3.0	93	2.8	0.459	13.3	LOS B	3.6	92.7	0.90	0.99	1.03	30.9
Approach		256	3.0	263	2.9	0.459	14.1	LOS B	3.6	92.7	0.90	0.99	1.03	31.3
NorthWest: Innis Arden Way														
7bx	L3	25	3.0	25	3.0	0.288	11.3	LOS B	1.3	32.4	0.44	0.68	0.44	34.9
7ax	L1	80	3.0	80	3.0	0.288	9.4	LOS A	1.3	32.4	0.44	0.68	0.44	34.4
14ax	R1	135	3.0	135	3.0	0.288	5.7	LOS A	1.3	32.4	0.44	0.68	0.44	34.7
14bx	R3	25	3.0	25	3.0	0.288	6.4	LOS A	1.3	32.4	0.44	0.68	0.44	33.9
Approach		265	3.0	265	3.0	0.288	7.4	LOS A	1.3	32.4	0.44	0.68	0.44	34.5
West: West Leg N 160th St														
5b	L3	10	3.0	10	3.0	0.122	12.1	LOS B	0.7	17.3	0.55	0.65	0.55	34.6
5	L2	15	3.0	15	3.0	0.122	11.2	LOS B	0.7	17.3	0.55	0.65	0.55	34.4
2	T1	75	3.0	75	3.0	0.122	6.9	LOS A	0.7	17.3	0.55	0.65	0.55	34.6
12	R2	15	3.0	15	3.0	0.122	6.7	LOS A	0.7	17.3	0.55	0.65	0.55	33.9
Approach		115	3.0	115	3.0	0.122	7.9	LOS A	0.7	17.3	0.55	0.65	0.55	34.5
All Vehicles		1521	3.0	1528	3.0	0.717	11.3	LOS B	8.6	221.1	0.68	0.85	0.81	32.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
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Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.