MEMORANDUM

DETAILS

Robinson Consultants

DATE: March 19, 2024

TO: Sara Akkaoui, P. Eng., Senior Engineer, Transit Priority, OC Transpo

FROM: Robert Cotnam, P. Eng.

SUBJECT: Jeanne d'Arc Boulevard Transit Priority Measures

BACKGROUND

With the ongoing east extension of the City of Ottawa's LRT system (Stage 2), the City has identified necessary network improvements in support of the new Jeanne d'Arc O-Train station at OR 174 and Jeanne d'Arc Boulevard. Significant bus operational challenges are anticipated at the Jeanne d'Arc O-Train station once Stage 2 is operational. Specifically, afternoon peak period routes servicing the station will require a convoluted and inefficient deadhead routing to serve the southbound bus platform. This would result in increased bus volumes in residential areas, additional travel time, increased operational costs, and negative community impacts. To facilitate southbound bus connections and improve bus service reliability at the Jeanne d'Arc O-Train station, the City and OC Transpo have identified the potential to construct a roundabout intersection at Jeanne d'Arc and Fortune Drive / Vineyard Drive; this will permit a routing for buses exiting OR 174 eastbound at Jeanne d'Arc to complete a U-Turn Movement and continue southbound to the Jeanne d'Arc Station streetside platform.

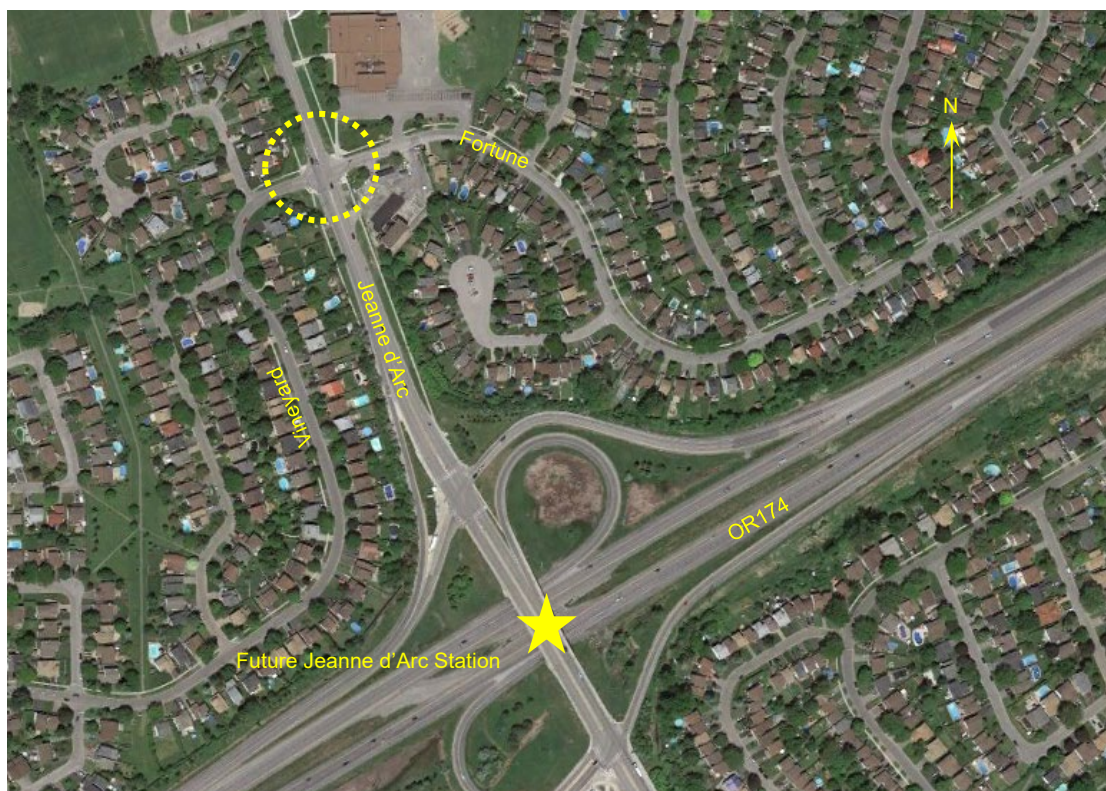The subject intersection is illustrated in Figure 1.

Figure 1 – Study Area

The City of Ottawa has retained Robinson Consultants Inc. (RCI) to carry out a transportation analysis and functional design and assessment for the proposed roundabout. The following memorandum provides a summary of the transportation analysis carried out as part of the project.

EXISTING CORRIDOR CONDITIONS

The existing Jeanne d'Arc Boulevard corridor is a four-lane major collector which transitions to a four-lane arterial at the existing OR174 interchange south of the subject intersection. Vineyard Drive and Fortune Drive are two-lane local roads. The existing intersection is currently signalized.

Covent Glen Catholic School is located immediately northeast of the intersection, and Ottawa Fire Station 52 is located approximately 165m north of the intersection on the west side of Jeanne d'Arc.

EXISTING AND FUTURE TRAFFIC VOLUMES

The existing (2020) traffic volume counts were provided by the City of Ottawa and are illustrated in Figure 2. As the proposed roundabout is being provided to accommodate northbound to southbound bus U-Turn Movements, which do not currently exist, a peak hourly volume of 20 busses has been assumed to ensure movements are considered in the analysis.

Figure 2 – Existing (2020) Traffic Volumes

| Existing (2020) AM Peak Volumes | Existing (2020) PM Peak Volumes |
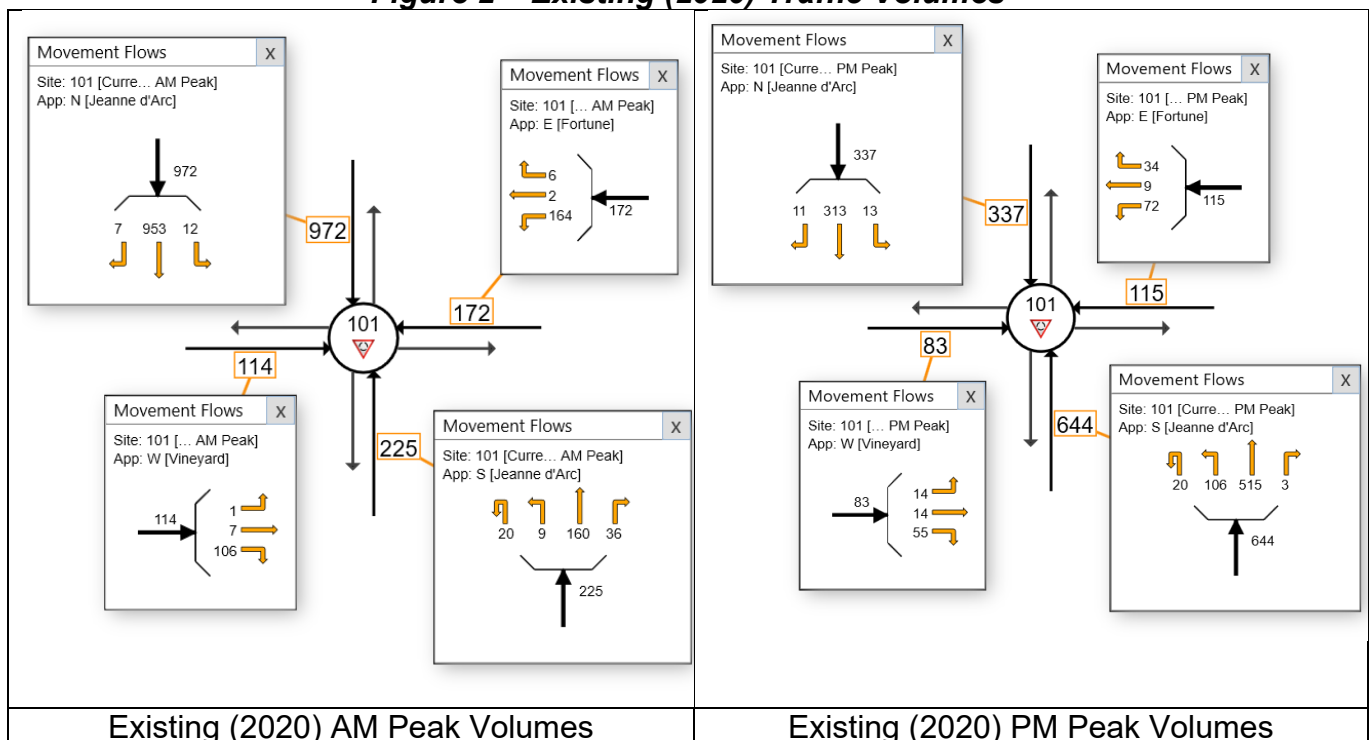
For the purposes of this analysis, an annual growth rate of 2% has been assumed in the evaluation of future operations.

PROPOSED ROUNDABOUT CONFIGURATION

As the existing Jeanne d'Arc corridor is currently four-lanes, the scope of this assignment identified that the proposed roundabout would be a multi-lane configuration on the north and south (Jeanne d'Arc) legs, with a single lane configuration on the east (Fortune) and west (Vineyard) legs. Refer to Figure 3 for the proposed roundabout configuration.
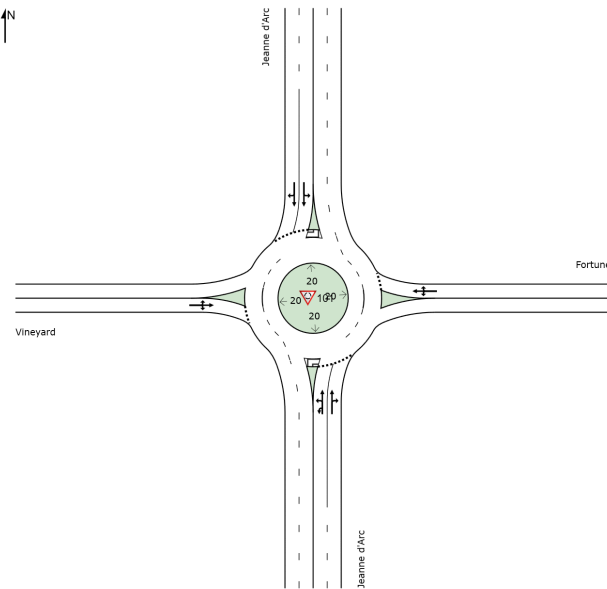

Figure 3 – Proposed Roundabout Configuration

TRANSPORTATION ANALYSIS

The intersection performance has been evaluated considering the existing (2020) and future (20 year / 2040) volumes were assessed using the Sidra Intersection 9.0 Model.

A summary of the anticipated roundabout performance is presented in **Table 1,** below.

Table 1 Summary of Roundabout Performance (Multi-Lane Configuration)				
Horizon	Roundabout			
	AM Peak Hour		PM Peak Hour	
	LOS	Intersection Delay (s)	LOS	Intersection Delay (s)
2020	A	0.9	A	0.5
2040	A	2.3	A	0.7

The projected Level of Service (LOS) and overall intersection delays are acceptable in all horizons. Average intersection delays are anticipated to be very low, ranging from 0.5 seconds to 2.3 seconds, with the overall Level of Service (LOS) being A in all periods. In consideration of the individual approaches to the roundabout, the analysis projected that the anticipated delays of

each leg would range from 0 seconds to 4.5 seconds in the current period and 0.1 seconds to 14.2 seconds in the 2040 period. The most significant delay being experienced in the eastbound AM Peak, resulting in a Level of Service of B for this approach.   All other movements are anticipated to operate at a Level of Service of A.

The detailed results of the transportation analysis are appended to this memorandum.

SINGLE LANE ROUNDABOUT CONSIDERATION

Based on the results of the transportation analysis, the proposed roundabout is expected to operate at an acceptable Level of Service in all periods, for all movements. As such, the analysis has confirmed that a roundabout would be an acceptable at this location. Given the results of the initial transportation analysis completed, an additional evaluation was carried out to consider the feasibility of utilizing a single lane roundabout at the intersection, due to the acceptable level of service anticipated through 2040.   The single lane roundabout configuration considered is illustrated in Figure 4, below.
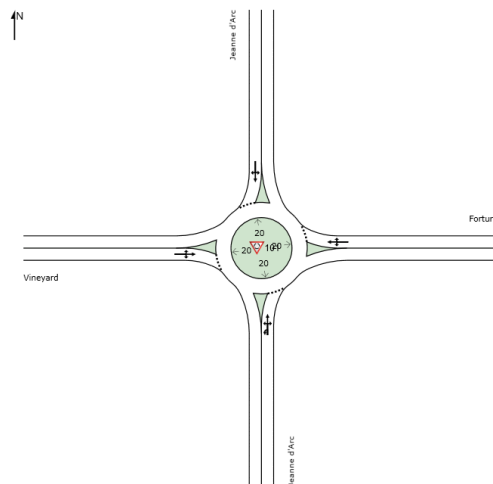

Figure 4 – Proposed Single Lane Roundabout Configuration

The evaluation determined that a single lane roundabout would operate effectively under 2020 volumes, with the anticipated approach delays ranging from 0.1 seconds to 13.6 seconds. Once again, the most significant delay being experienced in the eastbound AM Peak, resulting in a Level of Service of B for this approach. All other movements are anticipated to operate at a Level of Service of A.

The initial evaluation of a single lane roundabout was carried out in consideration a 2% compounding growth rate, which found the future (2040) operations, that a single lane roundabout would continue to operate at a LOS of A for all movements in the PM peak but would fail in the AM Peak due to a delay of 251 seconds (LOS F) on the eastbound leg due to the significant conflicting southbound through volumes anticipated on Jeanne d'Arc. A sensitivity analysis, using the assumed 2% annual growth rate, indicated that a single lane roundabout would operate effectively for approximately 9 years before the eastbound leg would reach a LOS of E in the AM period.   Further consideration of a 1% growth rate indicated the single lane roundabout would

operate effectively for approximately 19 years before the eastbound leg would reach a LOS of E. The detailed results of the additional analysis are also appended to this memorandum.

In light of the results of this analysis, it was requested that RCI explore the opportunity of providing a single lane roundabout, as an interim facility, in consideration of the enhanced pedestrian crossing accommodations for the adjacent elementary school and the traffic calming benefits associated with a single lane roundabout. Given the proximity of the intersection to the school, it expected that pedestrian safety will be a paramount concern for the community, and the reduced crossing distances and reduced speeds of a single lane facility would be expected to less of a concern for vulnerable pedestrians.

As part of this follow up analysis, the City of Ottawa provided refined growth rate protections for the corridors of:
- Jeanne d'Arc Boulevard – 1.0% to 1.5%
- Fortune Drive / Vineyard Drive – 0.5% to 1.0%

Using the provided growth rates, a follow up analysis was carried out to evaluate the AM peak operations considering 2 scenarios:

- Scenario 1 – 0.5% growth on local streets and
     1.0% growth on Jeanne d'Arc
- Scenario 2 – 1.0% growth on local streets and
   1.5% on Jeanne d'Arc

Based on the refined growth rate scenarios, updated sensitivity analysis was carried out out which found that the intersection would operate at an overall Level of Service B or better in all periods. However, in consideration of the eastbound (Vineyard) leg in the AM period, the analysis determined that the LOS for this movement would reach a LOS of E in approximately 19.5 years under Scenario 1, or approximately 12.5 years under Scenario 2. The results of the follow up analysis are presented in *Table 2*, below.

	Table 2			
Summary of Roundabout of AM Peak Roundabout Performance – West Leg				
Analysis	Years to Reach LOS E (Final Year)	Years to Reach LOS F	Avg. Delay in Final Year (Rounded)	95% Back of Queue Length (Final Year)
Scenario 1	19.5	>20	20-Year 58s	44m
Scenario 2	12.5	14	13-Year 60s	46m

PM peak operations were not considered as the initial single lane roundabout analysis determined they would continue to operate at LOS A through 2040 considering a 2% growth rate. As such, PM peak operations of the roundabout would be expected remain at an acceptable level in consideration of the refined growth rates provided by the City.

Following completion of this follow up analysis, additional evaluation was carried out to consider any potential impacts on the OR 174 interchange ramp intersections, located approximately 300m south of the Jeanne d'Arc and Fortune/Vineyard intersection. This evaluation was summarized in the memorandum titled *Jeanne d'Arc Boulevard / Fortune Roundabout and OR174 Ramp Intersection – Traffic Analysis* provided under separate cover. As part of this evaluation, updated 2023 traffic volumes were provided. The updated traffic volumes are provided in ***Figure 5***, below.

Figure 5 – Updated Existing (2023) Traffic Volumes

Existing (2023) AM Peak Volumes	Existing (2023) PM Peak Volumes
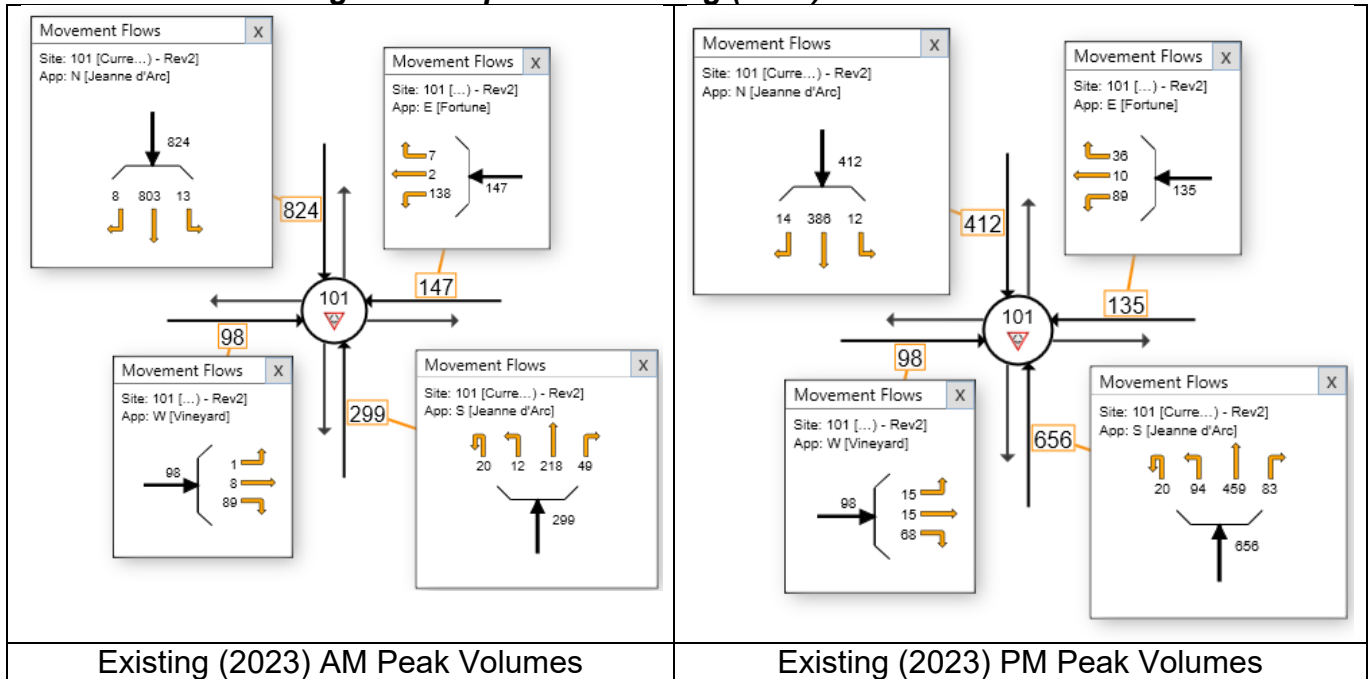
Based on the updated traffic volume data, the previously completed sensitivity analysis was reevaluated. Utilizing the updated volumes, the final year (20 year) operations of the single lane roundabout were found to be an overall LOS of A under both Scenario 1 and Scenario 2. Further, it was noted that the eastbound leg operations are also expected to operate effectively in the final year (20 year) horizon at an anticipated LOS of B and C, under Scenario 1 and Scenario 2, respectively.

The anticipated operations under each scenario (Scenario 1 and Scenario 2 considering the 2020 volumes, and Scenario 1 Rev and Scenario 2 Rev considering the updated 2023 volumes) have been summarized in the graph provided in ***Figure 6***, below.
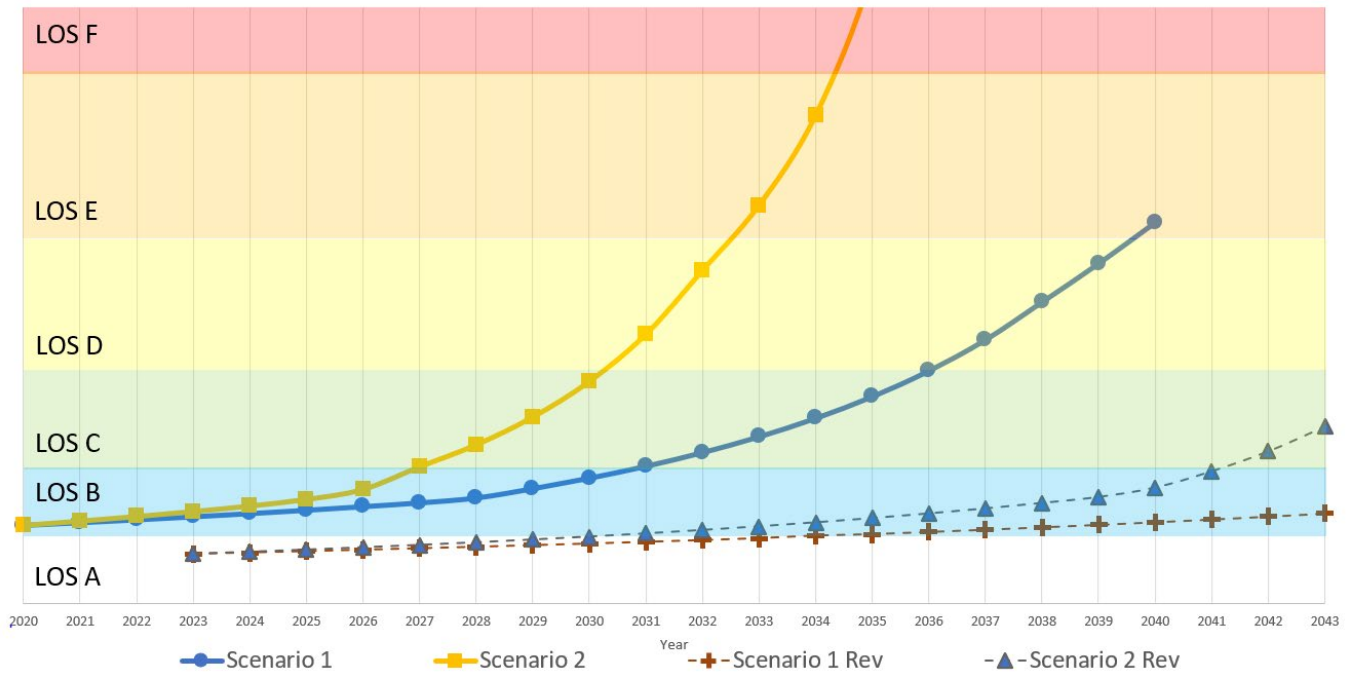
Figure 6 – Forecasted Operations – Single Lane Roundabout

ROAD SAFETY AUDIT

In consideration of the proposed roundabout, it was requested that a Road Safety Audit (RSA) be carried out to consider the potential benefits or concerns with the use of a roundabout at this location and recommend potential refinements or improvements to the facility to enhance the overall safety of the proposed facility.   The RSA was completed in January 2024 by True North Safety (TNS). The RSA considered the potential for both a single-lane and multi-lane facility and noted:

> *"Multi-lane roundabouts are typically implemented on arterial roadways to accommodate high vehicular volumes. However, the implementation of a multi-lane roundabout at the subject location does not seem to align well with the primarily residential surrounding land use, especially considering the anticipated increase in pedestrian traffic. TNS agrees with the design team's findings, and strongly supports the single-lane roundabout option."*

The Road Safety Audit Report has been provided under separate cover.

DISCUSSION

Given the results of the transportation analysis completed, it has been determined that the intersection of Jeanne d'Arc and Fortune / Vineyard is expected to operate effectively as a roundabout, to facilitate the necessary transit U-turn movements. Additionally, follow-up analysis has confirmed that the intersection would operate effectively as a single lane roundabout for at least 12 years, and potentially beyond the 20-year horizon.   Given the proximity of the intersection to the school, it expected that pedestrian safety will be a paramount concern for the community,

and the reduced crossing distances and reduced speeds of a single-lane facility would be expected to less of a concern for vulnerable pedestrians. As such, there would be considerable benefits to the use of a single-lane roundabout as interim facility, namely the enhanced pedestrian crossing accommodations for the adjacent elementary school and the traffic calming benefits associated with a single lane roundabout.

In light of the results of this analysis and the recommendations of the RSA, the City should consider the application of a single lane roundabout at this location as an interim facility as the transportation analysis indicates it would be expected to operate effectively in the near term and potentially long term and would provide enhanced safety benefits over a multi-lane facility.

LANE LEVEL OF SERVICE

▽ **Site: 101 [Current AM Peak (Site Folder: General)]**

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

⚠ Site: 101 [Current AM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Vehicle Movement Performance														
South: Jeanne d'Arc														
1u	U	20	100.0	21	100.0	0.073	0.1	LOS A	0.3	2.8	0.09	0.02	0.09	48.6
1	L2	9	22.2	9	22.2	0.073	0.1	LOS A	0.3	2.8	0.09	0.02	0.09	48.0
2	T1	160	6.0	168	6.0	0.073	0.0	LOS A	0.3	2.5	0.09	0.02	0.09	48.5
3	R2	36	8.3	38	8.3	0.073	0.1	LOS A	0.3	2.5	0.08	0.02	0.08	47.6
Approach		225	15.4	237	15.4	0.073	0.1	LOS A	0.3	2.8	0.09	0.02	0.09	48.3
East: Fortune														
4	L2	164	0.0	173	0.0	0.117	0.5	LOS A	0.5	3.6	0.30	0.17	0.30	46.2
5	T1	2	0.0	2	0.0	0.117	0.5	LOS A	0.5	3.6	0.30	0.17	0.30	46.0
6	R2	6	0.0	6	0.0	0.117	0.5	LOS A	0.5	3.6	0.30	0.17	0.30	45.1
Approach		172	0.0	181	0.0	0.117	0.5	LOS A	0.5	3.6	0.30	0.17	0.30	46.2
North: Jeanne d'Arc														
7	L2	12	0.0	13	0.0	0.338	0.8	LOS A	2.1	14.5	0.40	0.22	0.40	47.9
8	T1	953	0.0	1003	0.0	0.338	0.8	LOS A	2.1	14.5	0.40	0.22	0.40	47.8
9	R2	7	0.0	7	0.0	0.338	0.8	LOS A	2.1	14.5	0.40	0.22	0.40	46.6
Approach		972	0.0	1023	0.0	0.338	0.8	LOS A	2.1	14.5	0.40	0.22	0.40	47.8
West: Vineyard														
10	L2	1	0.0	1	0.0	0.171	4.5	LOS A	0.9	6.2	0.75	0.73	0.75	46.7
11	T1	7	0.0	7	0.0	0.171	4.5	LOS A	0.9	6.2	0.75	0.73	0.75	46.5
12	R2	106	0.0	112	0.0	0.171	4.5	LOS A	0.9	6.2	0.75	0.73	0.75	45.5
Approach		114	0.0	120	0.0	0.171	4.5	LOS A	0.9	6.2	0.75	0.73	0.75	45.6
All Vehicles		1483	2.3	1561	2.3	0.338	0.9	LOS A	2.1	14.5	0.37	0.22	0.37	47.5

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

▽ **Site: 101 [Current PM Peak (Site Folder: General)]**

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

MOVEMENT SUMMARY

▼ Site: 101 [Current PM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	21	100.0	0.200	0.3	LOS A	1.1	7.9	0.15	0.05	0.15	48.3
1	L2	106	1.9	112	1.9	0.200	0.1	LOS A	1.1	7.9	0.15	0.05	0.15	47.8
2	T1	515	1.6	542	1.6	0.200	0.1	LOS A	1.1	7.5	0.15	0.05	0.15	48.4
3	R2	3	4.3	3	4.3	0.200	0.1	LOS A	1.1	7.5	0.15	0.05	0.15	47.4
Approach		644	4.7	678	4.7	0.200	0.1	LOS A	1.1	7.9	0.15	0.05	0.15	48.3
East: Fortune														
4	L2	72	0.0	76	0.0	0.112	1.9	LOS A	0.5	3.6	0.54	0.44	0.54	46.5
5	T1	9	3.8	9	3.8	0.112	2.0	LOS A	0.5	3.6	0.54	0.44	0.54	46.2
6	R2	34	9.1	36	9.1	0.112	2.1	LOS A	0.5	3.6	0.54	0.44	0.54	45.2
Approach		115	3.0	121	3.0	0.112	2.0	LOS A	0.5	3.6	0.54	0.44	0.54	46.1
North: Jeanne d'Arc														
7	L2	13	0.0	14	0.0	0.122	0.7	LOS A	0.6	4.2	0.34	0.18	0.34	48.0
8	T1	313	0.0	329	0.0	0.122	0.7	LOS A	0.6	4.2	0.34	0.18	0.34	48.0
9	R2	11	0.0	12	0.0	0.122	0.7	LOS A	0.6	4.2	0.34	0.18	0.34	46.8
Approach		337	0.0	355	0.0	0.122	0.7	LOS A	0.6	4.2	0.34	0.18	0.34	48.0
West: Vineyard														
10	L2	14	0.0	15	0.0	0.068	1.1	LOS A	0.3	2.3	0.45	0.30	0.45	47.8
11	T1	14	14.0	15	14.0	0.068	1.3	LOS A	0.3	2.3	0.45	0.30	0.45	47.5
12	R2	55	0.0	58	0.0	0.068	1.1	LOS A	0.3	2.3	0.45	0.30	0.45	46.6
Approach		83	2.4	87	2.4	0.068	1.2	LOS A	0.3	2.3	0.45	0.30	0.45	47.0
All Vehicles		1179	3.0	1241	3.0	0.200	0.5	LOS A	1.1	7.9	0.26	0.14	0.26	47.9

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
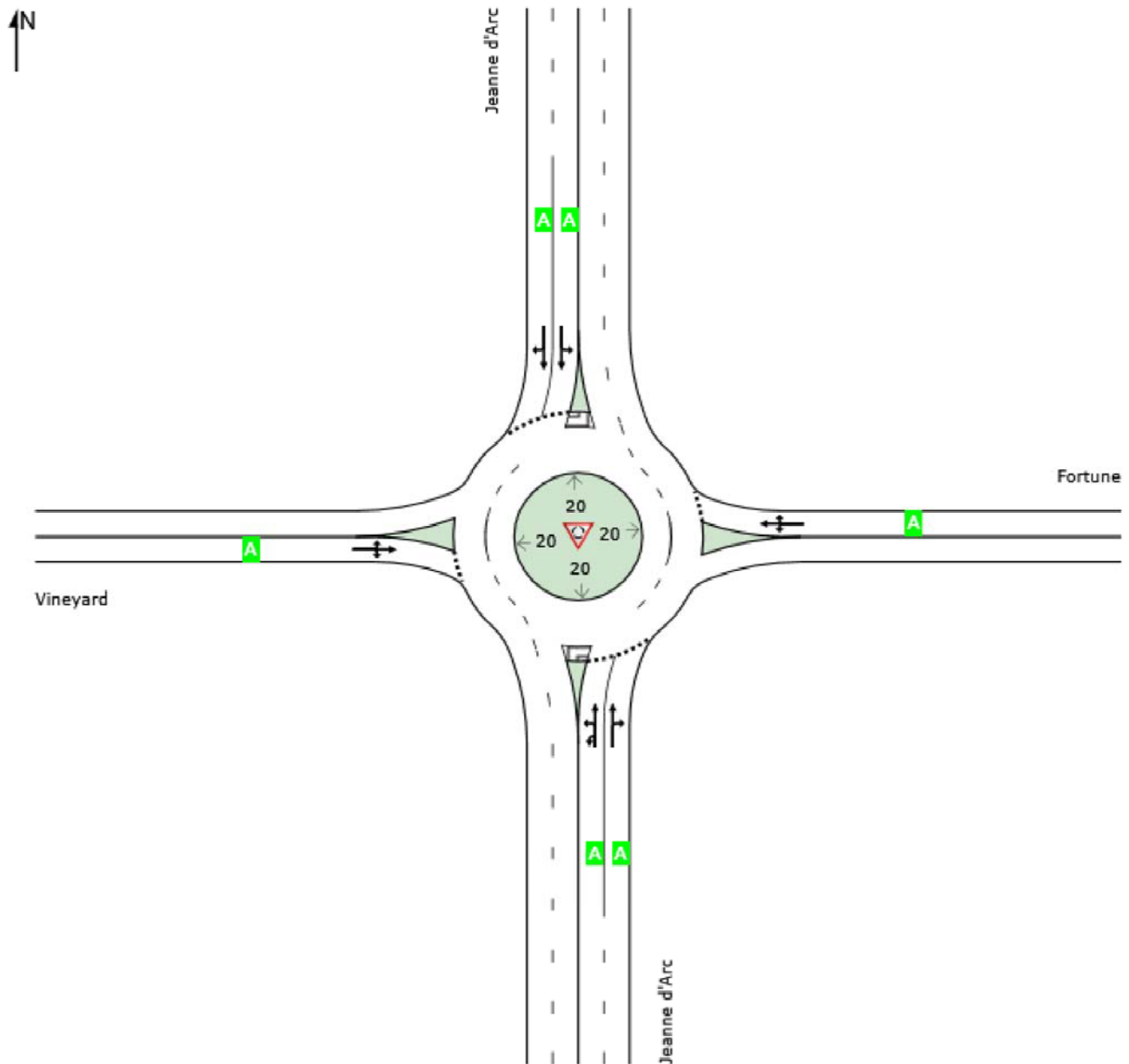Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

▽ Site: 101 [Future AM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A

MOVEMENT SUMMARY

⚠ Site: 101 [Future AM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

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 m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	31	100.0	0.110	0.2	LOS A	0.5	4.5	0.12	0.03	0.12	48.5
1	L2	9	22.2	14	22.2	0.110	0.1	LOS A	0.5	4.5	0.12	0.03	0.12	47.9
2	T1	160	6.0	250	6.0	0.110	0.1	LOS A	0.5	4.0	0.12	0.03	0.12	48.4
3	R2	36	8.3	56	8.3	0.110	0.1	LOS A	0.5	4.0	0.11	0.03	0.11	47.5
Approach		225	15.4	352	15.4	0.110	0.1	LOS A	0.5	4.5	0.12	0.03	0.12	48.2
East: Fortune														
4	L2	164	0.0	257	0.0	0.188	0.9	LOS A	0.9	6.2	0.39	0.26	0.39	46.0
5	T1	2	0.0	3	0.0	0.188	0.9	LOS A	0.9	6.2	0.39	0.26	0.39	45.8
6	R2	6	0.0	9	0.0	0.188	0.9	LOS A	0.9	6.2	0.39	0.26	0.39	44.9
Approach		172	0.0	269	0.0	0.188	0.9	LOS A	0.9	6.2	0.39	0.26	0.39	46.0
North: Jeanne d'Arc														
7	L2	12	0.0	19	0.0	0.552	1.7	LOS A	4.3	30.4	0.61	0.39	0.61	47.2
8	T1	953	0.0	1491	0.0	0.552	1.7	LOS A	4.3	30.4	0.61	0.39	0.61	47.1
9	R2	7	0.0	11	0.0	0.552	1.7	LOS A	4.3	30.4	0.61	0.39	0.61	45.8
Approach		972	0.0	1520	0.0	0.552	1.7	LOS A	4.3	30.4	0.61	0.39	0.61	47.0
West: Vineyard														
10	L2	1	0.0	2	0.0	0.477	14.2	LOS B	3.0	21.2	0.92	1.02	1.19	41.6
11	T1	7	0.0	11	0.0	0.477	14.2	LOS B	3.0	21.2	0.92	1.02	1.19	41.4
12	R2	106	0.0	166	0.0	0.477	14.2	LOS B	3.0	21.2	0.92	1.02	1.19	40.6
Approach		114	0.0	178	0.0	0.477	14.2	LOS B	3.0	21.2	0.92	1.02	1.19	40.7
All Vehicles		1483	2.3	2320	2.3	0.552	2.3	LOS A	4.3	30.4	0.54	0.37	0.56	46.5

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

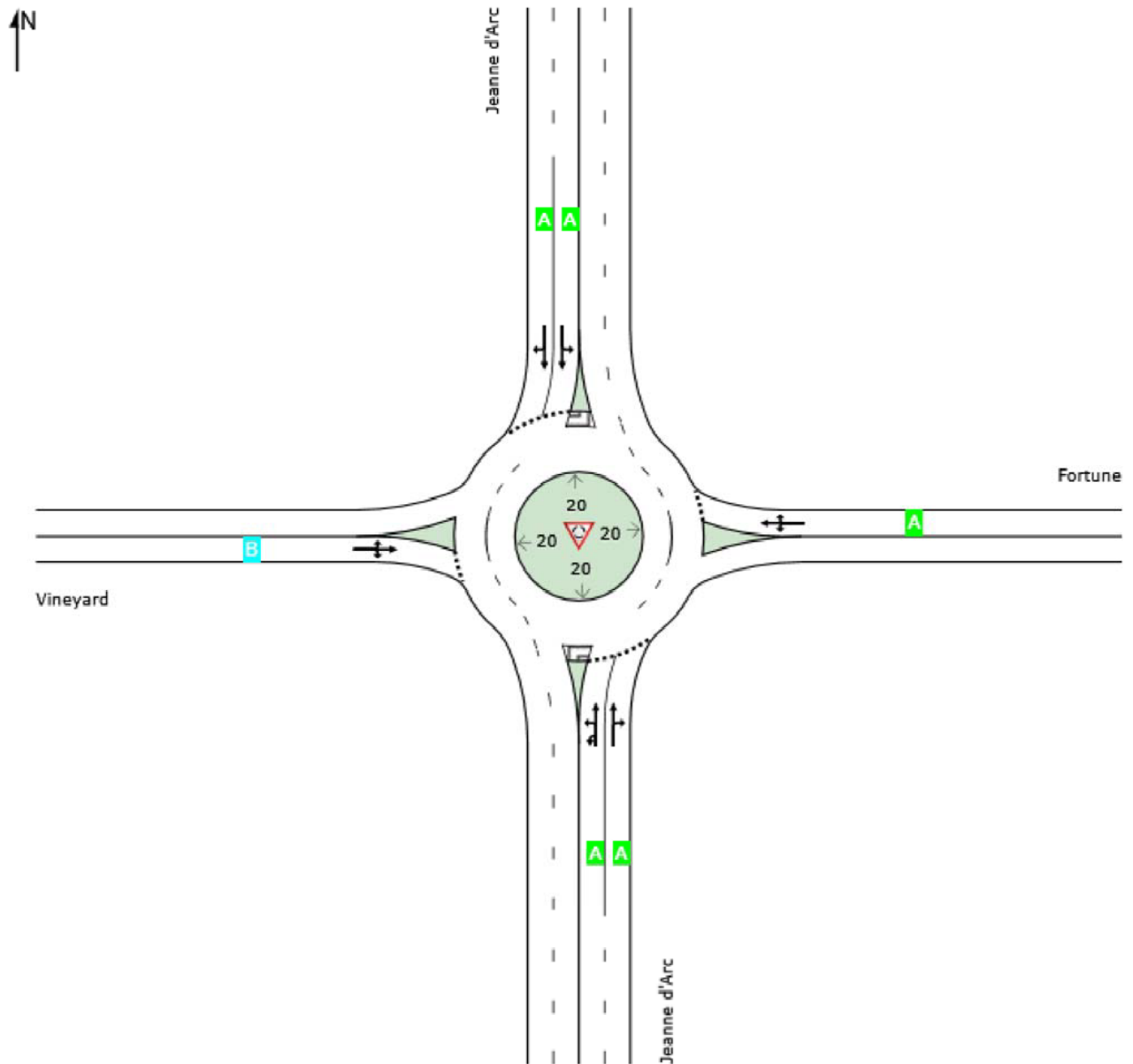## Site: 101 [Future AM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).
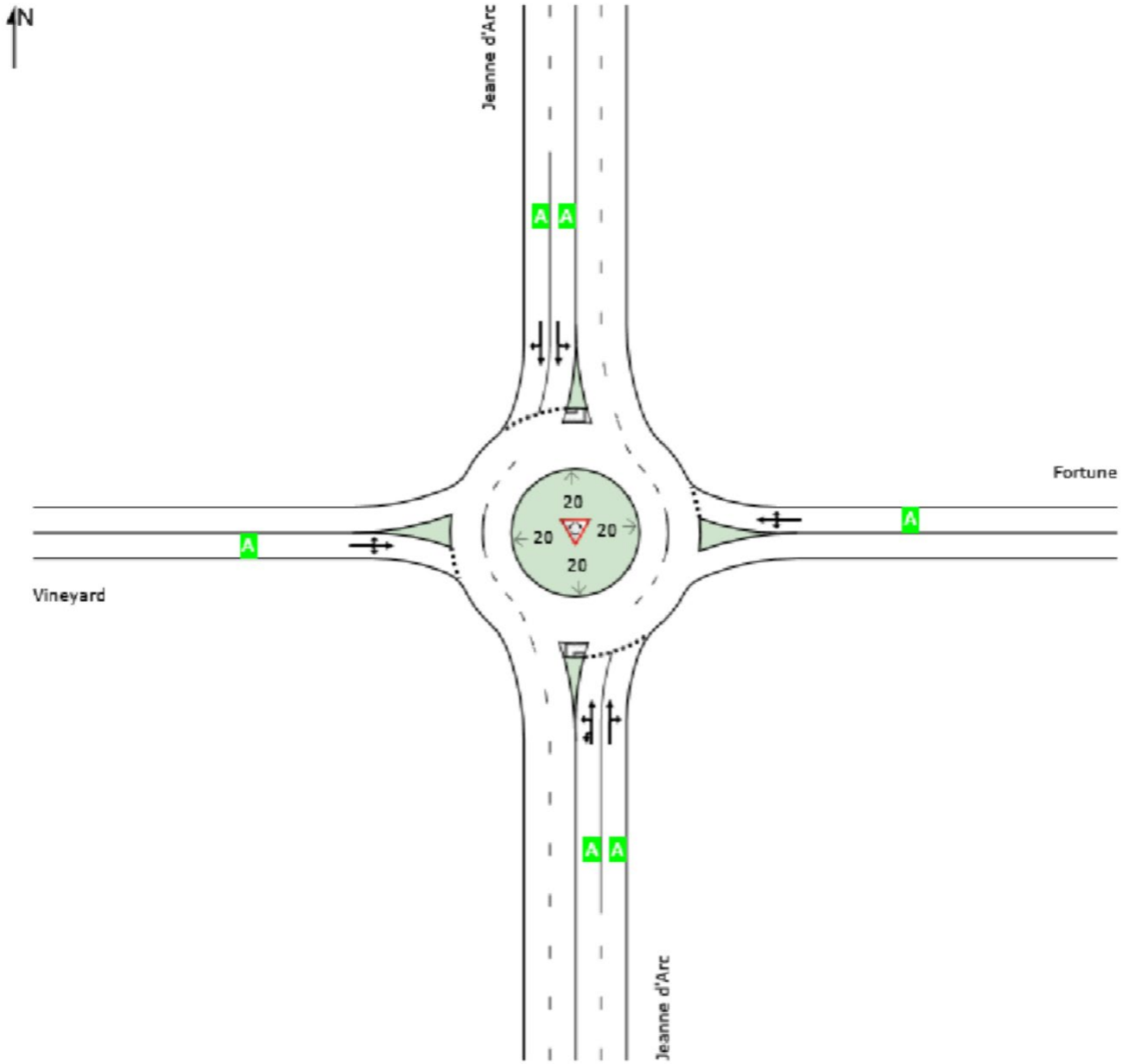
MOVEMENT SUMMARY

▽ Site: 101 [Future AM Peak (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	31	100.0	0.304	0.5	LOS A	1.8	13.8	0.21	0.09	0.21	48.1
1	L2	106	1.9	166	1.9	0.304	0.2	LOS A	1.8	13.8	0.21	0.09	0.21	47.6
2	T1	515	1.6	806	1.6	0.304	0.2	LOS A	1.9	13.1	0.21	0.08	0.21	48.1
3	R2	3	4.3	5	4.3	0.304	0.2	LOS A	1.9	13.1	0.21	0.08	0.21	47.2
Approach		644	4.7	1007	4.7	0.304	0.2	LOS A	1.9	13.8	0.21	0.08	0.21	48.1
East: Fortune														
4	L2	72	0.0	113	0.0	0.215	3.5	LOS A	1.1	7.5	0.68	0.66	0.68	45.7
5	T1	9	3.8	14	3.8	0.215	3.6	LOS A	1.1	7.5	0.68	0.66	0.68	45.4
6	R2	34	9.1	53	9.1	0.215	3.8	LOS A	1.1	7.5	0.68	0.66	0.68	44.5
Approach		115	3.0	180	3.0	0.215	3.6	LOS A	1.1	7.5	0.68	0.66	0.68	45.3
North: Jeanne d'Arc														
7	L2	13	0.0	20	0.0	0.202	1.2	LOS A	1.1	7.7	0.46	0.29	0.46	47.6
8	T1	313	0.0	490	0.0	0.202	1.2	LOS A	1.1	7.7	0.46	0.29	0.46	47.6
9	R2	11	0.0	17	0.0	0.202	1.2	LOS A	1.1	7.7	0.46	0.29	0.46	46.4
Approach		337	0.0	527	0.0	0.202	1.2	LOS A	1.1	7.7	0.46	0.29	0.46	47.5
West: Vineyard														
10	L2	14	0.0	22	0.0	0.122	1.9	LOS A	0.6	4.4	0.58	0.46	0.58	47.5
11	T1	14	14.0	22	14.0	0.122	2.2	LOS A	0.6	4.4	0.58	0.46	0.58	47.2
12	R2	55	0.0	86	0.0	0.122	1.9	LOS A	0.6	4.4	0.58	0.46	0.58	46.3
Approach		83	2.4	130	2.4	0.122	2.0	LOS A	0.6	4.4	0.58	0.46	0.58	46.6
All Vehicles		1179	3.0	1844	3.0	0.304	0.9	LOS A	1.9	13.8	0.35	0.22	0.35	47.5

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

▼ Site: 101 [Current AM Peak (Single) (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	21	100.0	0.145	0.1	LOS A	0.7	5.9	0.10	0.02	0.10	48.9
1	L2	9	22.2	9	22.2	0.145	0.1	LOS A	0.7	5.9	0.10	0.02	0.10	48.4
2	T1	160	6.0	168	6.0	0.145	0.1	LOS A	0.7	5.9	0.10	0.02	0.10	48.4
3	R2	36	8.3	38	8.3	0.145	0.1	LOS A	0.7	5.9	0.10	0.02	0.10	47.3
Approach		225	15.4	237	15.4	0.145	0.1	LOS A	0.7	5.9	0.10	0.02	0.10	48.2
East: Fortune														
4	L2	164	0.0	173	0.0	0.118	0.6	LOS A	0.6	4.0	0.32	0.18	0.32	46.0
5	T1	2	0.0	2	0.0	0.118	0.6	LOS A	0.6	4.0	0.32	0.18	0.32	45.8
6	R2	6	0.0	6	0.0	0.118	0.6	LOS A	0.6	4.0	0.32	0.18	0.32	44.9
Approach		172	0.0	181	0.0	0.118	0.6	LOS A	0.6	4.0	0.32	0.18	0.32	46.0
North: Jeanne d'Arc														
7	L2	12	0.0	13	0.0	0.674	1.4	LOS A	6.3	43.9	0.59	0.35	0.59	47.3
8	T1	953	0.0	1003	0.0	0.674	1.4	LOS A	6.3	43.9	0.59	0.35	0.59	47.1
9	R2	7	0.0	7	0.0	0.674	1.4	LOS A	6.3	43.9	0.59	0.35	0.59	46.1
Approach		972	0.0	1023	0.0	0.674	1.4	LOS A	6.3	43.9	0.59	0.35	0.59	47.1
West: Vineyard														
10	L2	1	0.0	1	0.0	0.296	13.6	LOS B	2.3	16.3	1.00	0.96	1.00	41.6
11	T1	7	0.0	7	0.0	0.296	13.6	LOS B	2.3	16.3	1.00	0.96	1.00	41.5
12	R2	106	0.0	112	0.0	0.296	13.6	LOS B	2.3	16.3	1.00	0.96	1.00	40.7
Approach		114	0.0	120	0.0	0.296	13.6	LOS B	2.3	16.3	1.00	0.96	1.00	40.8
All Vehicles		1483	2.3	1561	2.3	0.674	2.0	LOS A	6.3	43.9	0.51	0.33	0.51	46.6

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
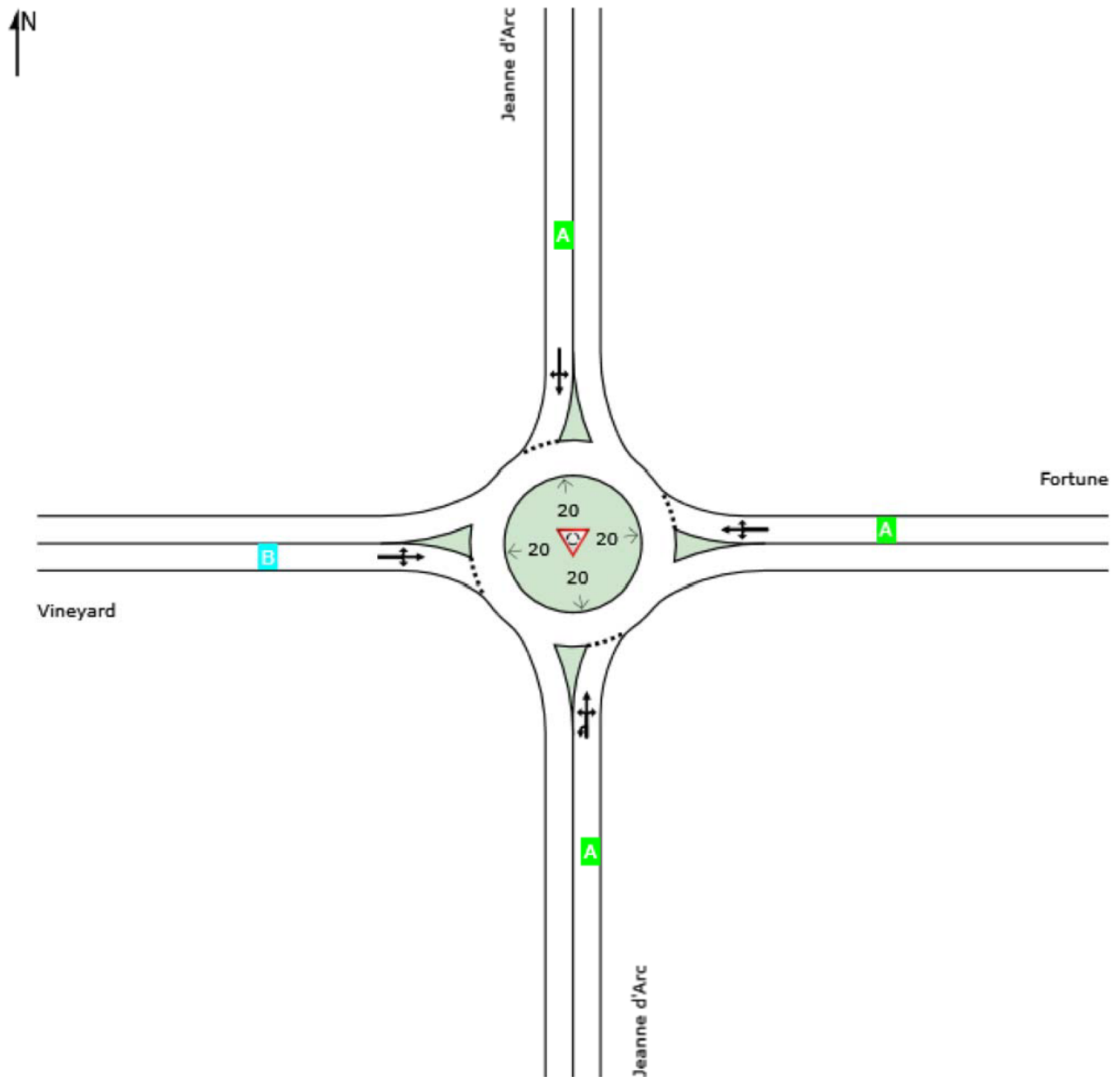Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

MOVEMENT SUMMARY

⚠ Site: 101 [Current PM Peak (Single) (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Vehicle Movement Performance														
South: Jeanne d'Arc														
1u	U	20	100.0	21	100.0	0.400	0.4	LOS A	2.7	19.6	0.18	0.07	0.18	48.5
1	L2	106	1.9	112	1.9	0.400	0.2	LOS A	2.7	19.6	0.18	0.07	0.18	48.2
2	T1	515	1.6	542	1.6	0.400	0.2	LOS A	2.7	19.6	0.18	0.07	0.18	48.0
3	R2	3	4.3	3	4.3	0.400	0.2	LOS A	2.7	19.6	0.18	0.07	0.18	47.0
Approach		644	4.7	678	4.7	0.400	0.2	LOS A	2.7	19.6	0.18	0.07	0.18	48.1
East: Fortune														
4	L2	72	0.0	76	0.0	0.126	3.4	LOS A	0.8	5.6	0.68	0.53	0.68	45.5
5	T1	9	3.8	9	3.8	0.126	3.5	LOS A	0.8	5.6	0.68	0.53	0.68	45.3
6	R2	34	9.1	36	9.1	0.126	3.7	LOS A	0.8	5.6	0.68	0.53	0.68	44.4
Approach		115	3.0	121	3.0	0.126	3.5	LOS A	0.8	5.6	0.68	0.53	0.68	45.2
North: Jeanne d'Arc														
7	L2	13	0.0	14	0.0	0.237	0.8	LOS A	1.3	9.4	0.38	0.21	0.38	48.0
8	T1	313	0.0	329	0.0	0.237	0.8	LOS A	1.3	9.4	0.38	0.21	0.38	47.8
9	R2	11	0.0	12	0.0	0.237	0.8	LOS A	1.3	9.4	0.38	0.21	0.38	46.8
Approach		337	0.0	355	0.0	0.237	0.8	LOS A	1.3	9.4	0.38	0.21	0.38	47.8
West: Vineyard														
10	L2	14	0.0	15	0.0	0.072	1.6	LOS A	0.4	2.8	0.51	0.34	0.51	47.5
11	T1	14	14.0	15	14.0	0.072	1.7	LOS A	0.4	2.8	0.51	0.34	0.51	47.3
12	R2	55	0.0	58	0.0	0.072	1.6	LOS A	0.4	2.8	0.51	0.34	0.51	46.3
Approach		83	2.4	87	2.4	0.072	1.6	LOS A	0.4	2.8	0.51	0.34	0.51	46.7
All Vehicles		1179	3.0	1241	3.0	0.400	0.8	LOS A	2.7	19.6	0.31	0.17	0.31	47.6

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
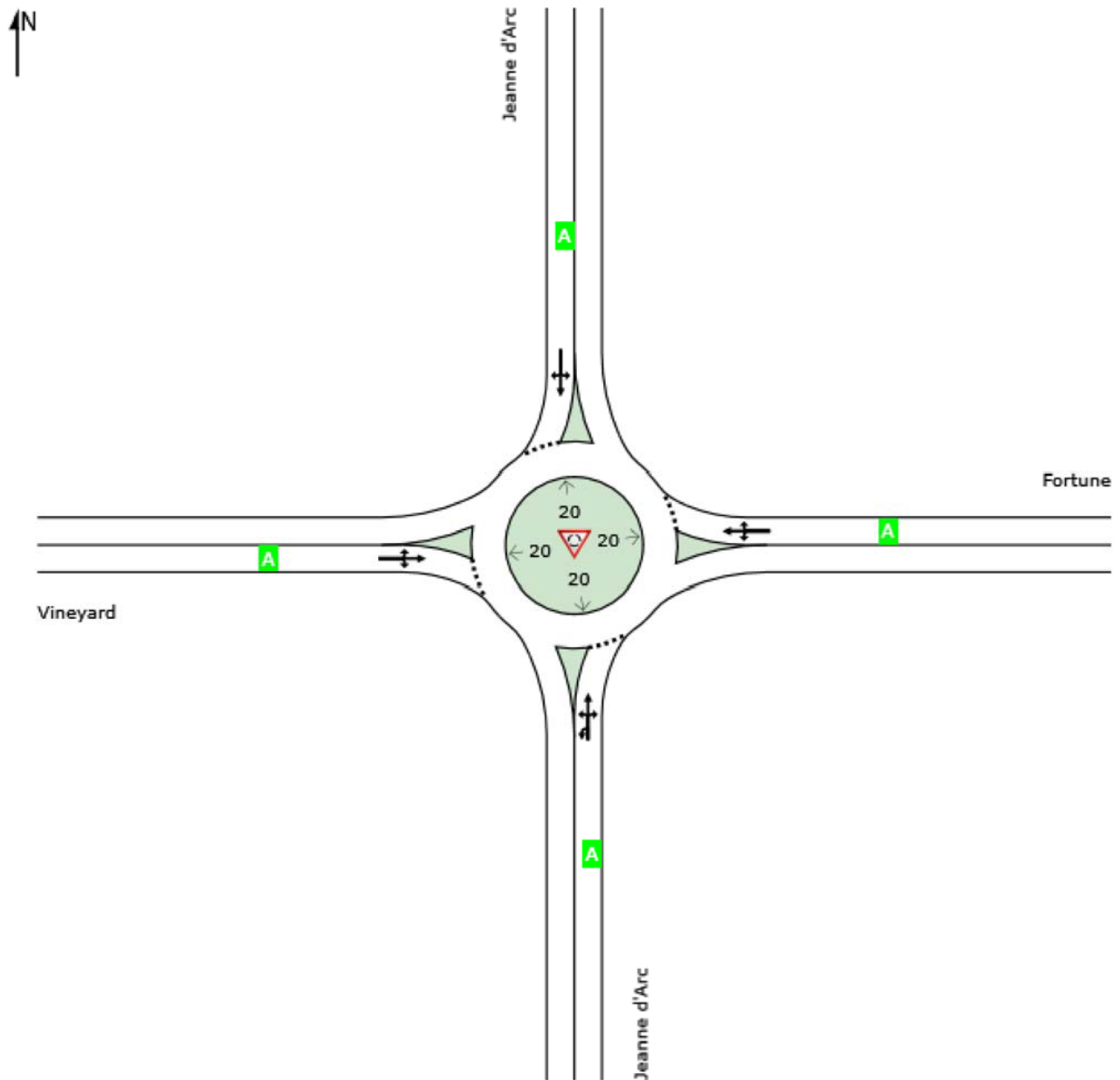Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

▽ **Site: 101 [Future AM Peak (Single) - Sensitivity (Site Folder: General)]**

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Lane)): Results for 9 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	E	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

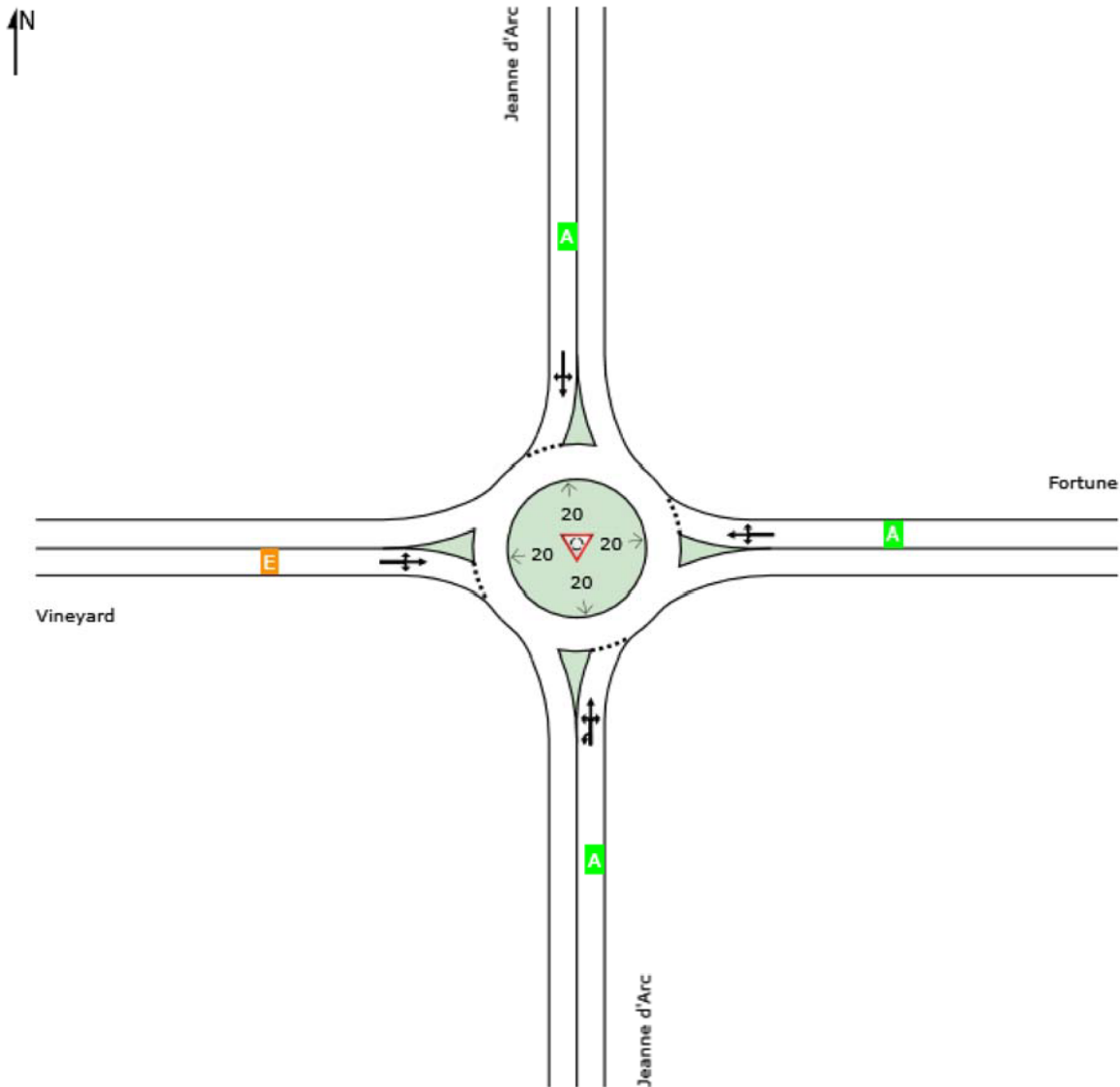## ▽ Site: 101 [Future AM Peak (Single) - Sensitivity (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Lane)): Results for 9 years

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	25	100.0	0.174	0.1	LOS A	0.9	7.5	0.11	0.03	0.11	48.8
1	L2	9	22.2	11	22.2	0.174	0.1	LOS A	0.9	7.5	0.11	0.03	0.11	48.4
2	T1	160	6.0	201	6.0	0.174	0.1	LOS A	0.9	7.5	0.11	0.03	0.11	48.3
3	R2	36	8.3	45	8.3	0.174	0.1	LOS A	0.9	7.5	0.11	0.03	0.11	47.2
Approach		225	15.4	283	15.4	0.174	0.1	LOS A	0.9	7.5	0.11	0.03	0.11	48.2
East: Fortune														
4	L2	164	0.0	206	0.0	0.146	0.8	LOS A	0.7	5.2	0.36	0.22	0.36	45.9
5	T1	2	0.0	3	0.0	0.146	0.8	LOS A	0.7	5.2	0.36	0.22	0.36	45.7
6	R2	6	0.0	8	0.0	0.146	0.8	LOS A	0.7	5.2	0.36	0.22	0.36	44.8
Approach		172	0.0	216	0.0	0.146	0.8	LOS A	0.7	5.2	0.36	0.22	0.36	45.9
North: Jeanne d'Arc														
7	L2	12	0.0	15	0.0	0.836	4.2	LOS A	13.9	97.1	0.82	0.67	0.95	46.5
8	T1	953	0.0	1199	0.0	0.836	4.2	LOS A	13.9	97.1	0.82	0.67	0.95	46.3
9	R2	7	0.0	9	0.0	0.836	4.2	LOS A	13.9	97.1	0.82	0.67	0.95	45.4
Approach		972	0.0	1223	0.0	0.836	4.2	LOS A	13.9	97.1	0.82	0.67	0.95	46.3
West: Vineyard														
10	L2	1	0.0	1	0.0	0.653	60.9	LOS E	6.9	48.6	1.00	1.30	1.73	27.0
11	T1	7	0.0	9	0.0	0.653	60.9	LOS E	6.9	48.6	1.00	1.30	1.73	27.0
12	R2	106	0.0	133	0.0	0.653	60.9	LOS E	6.9	48.6	1.00	1.30	1.73	26.7
Approach		114	0.0	143	0.0	0.653	60.9	LOS E	6.9	48.6	1.00	1.30	1.73	26.7
All Vehicles		1483	2.3	1866	2.3	0.836	7.5	LOS A	13.9	97.1	0.67	0.57	0.82	44.1

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Lane)): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

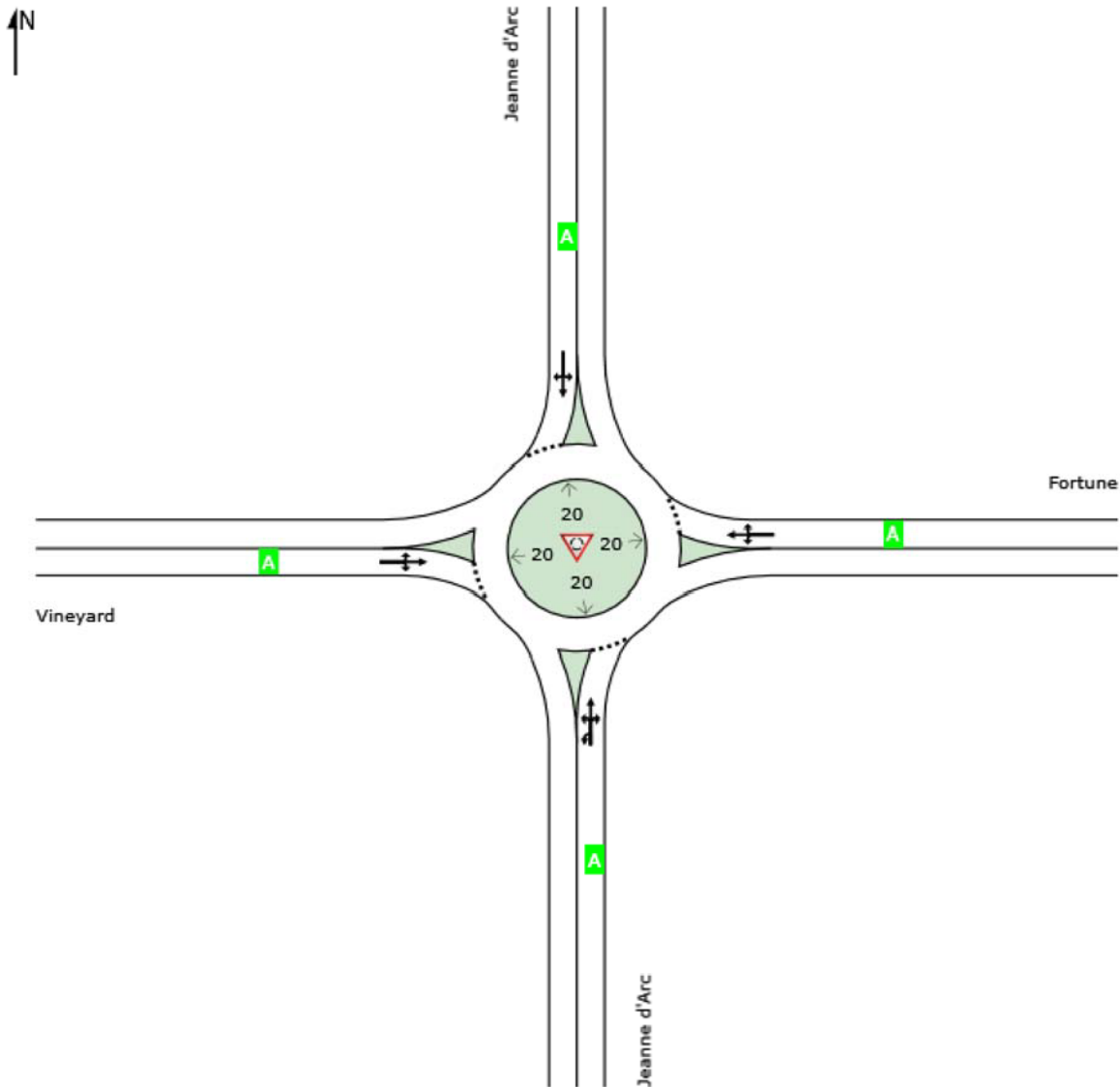## ▽ Site: 101 [Future PM Peak (Single) - Sensitivity (Site Folder: General)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Lane)): Results for 20 years

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	31	100.0	0.607	0.8	LOS A	5.8	42.2	0.32	0.14	0.32	48.1
1	L2	106	1.9	166	1.9	0.607	0.4	LOS A	5.8	42.2	0.32	0.14	0.32	47.8
2	T1	515	1.6	806	1.6	0.607	0.4	LOS A	5.8	42.2	0.32	0.14	0.32	47.6
3	R2	3	4.3	5	4.3	0.607	0.4	LOS A	5.8	42.2	0.32	0.14	0.32	46.6
Approach		644	4.7	1007	4.7	0.607	0.4	LOS A	5.8	42.2	0.32	0.14	0.32	47.6
East: Fortune														
4	L2	72	0.0	113	0.0	0.308	8.9	LOS A	2.3	16.4	0.93	0.87	0.93	42.6
5	T1	9	3.8	14	3.8	0.308	9.1	LOS A	2.3	16.4	0.93	0.87	0.93	42.5
6	R2	34	9.1	53	9.1	0.308	9.4	LOS A	2.3	16.4	0.93	0.87	0.93	41.6
Approach		115	3.0	180	3.0	0.308	9.1	LOS A	2.3	16.4	0.93	0.87	0.93	42.3
North: Jeanne d'Arc														
7	L2	13	0.0	20	0.0	0.391	1.5	LOS A	2.7	18.6	0.55	0.36	0.55	47.4
8	T1	313	0.0	490	0.0	0.391	1.5	LOS A	2.7	18.6	0.55	0.36	0.55	47.2
9	R2	11	0.0	17	0.0	0.391	1.5	LOS A	2.7	18.6	0.55	0.36	0.55	46.2
Approach		337	0.0	527	0.0	0.391	1.5	LOS A	2.7	18.6	0.55	0.36	0.55	47.2
West: Vineyard														
10	L2	14	0.0	22	0.0	0.138	3.1	LOS A	0.9	6.4	0.70	0.55	0.70	46.8
11	T1	14	14.0	22	14.0	0.138	3.4	LOS A	0.9	6.4	0.70	0.55	0.70	46.5
12	R2	55	0.0	86	0.0	0.138	3.1	LOS A	0.9	6.4	0.70	0.55	0.70	45.6
Approach		83	2.4	130	2.4	0.138	3.2	LOS A	0.9	6.4	0.70	0.55	0.70	46.0
All Vehicles		1179	3.0	1844	3.0	0.607	1.7	LOS A	5.8	42.2	0.47	0.30	0.47	46.8

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix B TRANSPORTION
ANALYSIS -
Revised Analysis (Scenario 1 & 2)

LANE LEVEL OF SERVICE

Site: 101 [Future AM Peak (Single) - Scenario 1 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

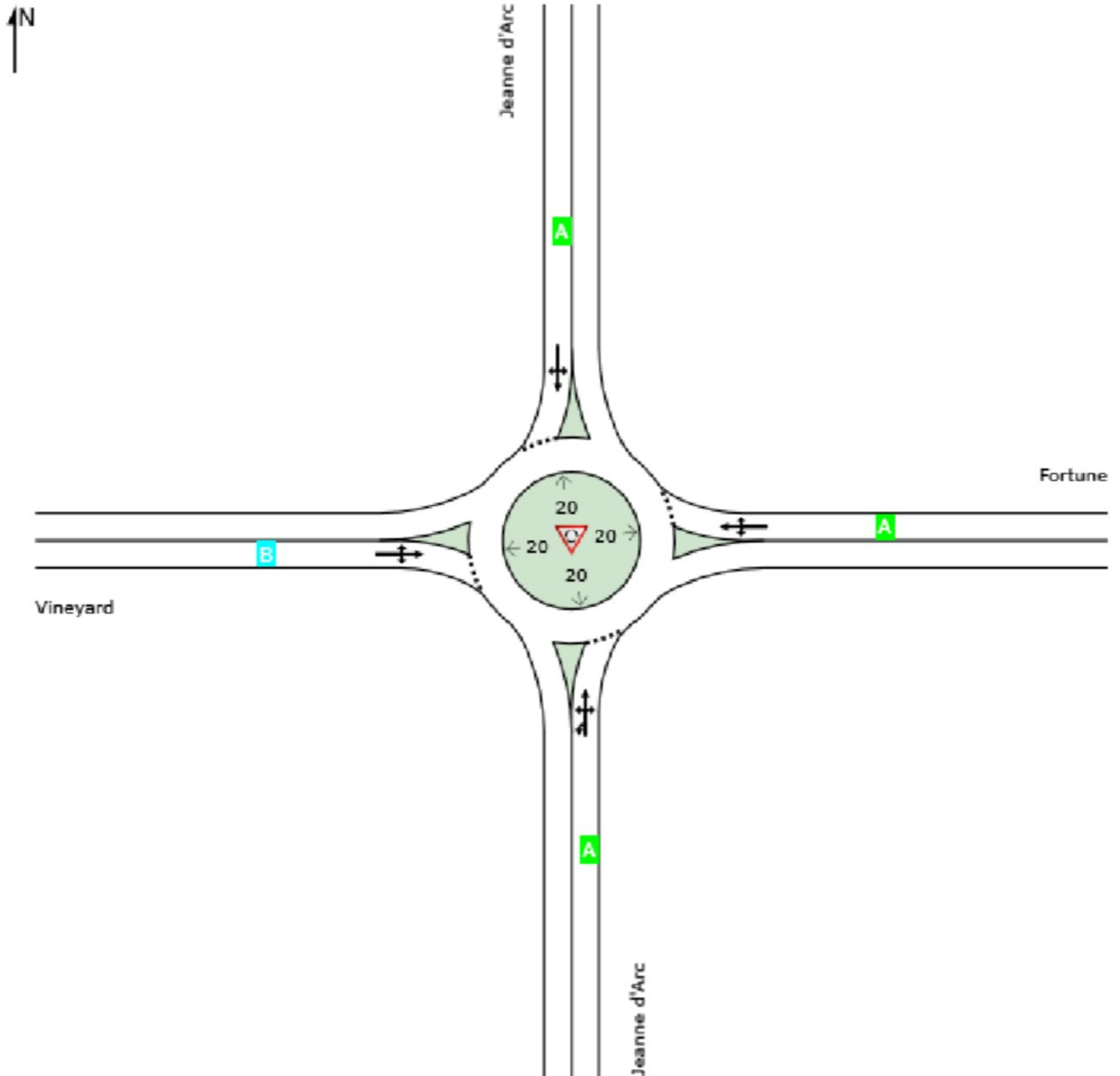## ▼ Site: 101 [Future AM Peak (Single) - Scenario 1 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

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	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	26	100.0	0.228	0.2	LOS A	1.3	9.6	0.12	0.03	0.12	49.0
1	L2	12	1.9	15	1.9	0.228	0.1	LOS A	1.3	9.6	0.12	0.03	0.12	48.6
2	T1	218	1.6	280	1.6	0.228	0.1	LOS A	1.3	9.6	0.12	0.03	0.12	48.4
3	R2	49	4.3	63	4.3	0.228	0.1	LOS A	1.3	9.6	0.12	0.03	0.12	47.3
Approach		299	8.6	384	8.6	0.228	0.1	LOS A	1.3	9.6	0.12	0.03	0.12	48.3
East: Fortune														
4	L2	138	0.0	161	0.0	0.124	1.1	LOS A	0.6	4.5	0.42	0.27	0.42	45.8
5	T1	2	3.8	2	3.8	0.124	1.1	LOS A	0.6	4.5	0.42	0.27	0.42	45.6
6	R2	7	9.1	8	9.1	0.124	1.2	LOS A	0.6	4.5	0.42	0.27	0.42	44.6
Approach		147	0.5	171	0.5	0.124	1.1	LOS A	0.6	4.5	0.42	0.27	0.42	45.7
North: Jeanne d'Arc														
7	L2	13	0.0	17	0.0	0.706	1.4	LOS A	6.9	48.1	0.62	0.37	0.62	47.2
8	T1	803	0.0	1031	0.0	0.706	1.4	LOS A	6.9	48.1	0.62	0.37	0.62	47.0
9	R2	8	0.0	10	0.0	0.706	1.4	LOS A	6.9	48.1	0.62	0.37	0.62	46.0
Approach		824	0.0	1058	0.0	0.706	1.4	LOS A	6.9	48.1	0.62	0.37	0.62	47.0
West: Vineyard														
10	L2	1	0.0	1	0.0	0.278	12.7	LOS B	2.1	15.1	1.00	0.96	1.00	42.0
11	T1	8	14.0	9	14.0	0.278	13.5	LOS B	2.1	15.1	1.00	0.96	1.00	41.8
12	R2	89	0.0	104	0.0	0.278	12.7	LOS B	2.1	15.1	1.00	0.96	1.00	41.1
Approach		98	1.1	114	1.1	0.278	12.8	LOS B	2.1	15.1	1.00	0.96	1.00	41.2
All Vehicles		1368	2.0	1727	2.0	0.706	1.9	LOS A	6.9	48.1	0.51	0.33	0.51	46.7

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

▼ Site: 101 [Future PM Peak (Single) - Scenario 1 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

▼ Site: 101 [Future PM Peak (Single) - Scenario 1 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Jeanne d'Arc														
1u	U	20	100.0	26	100.0	0.519	0.5	LOS A	4.3	32.9	0.25	0.10	0.25	48.0
1	L2	94	22.2	121	22.2	0.519	0.3	LOS A	4.3	32.9	0.25	0.10	0.25	47.9
2	T1	459	6.0	590	6.0	0.519	0.2	LOS A	4.3	32.9	0.25	0.10	0.25	47.9
3	R2	83	8.3	107	8.3	0.519	0.2	LOS A	4.3	32.9	0.25	0.10	0.25	46.8
Approach		656	11.5	843	11.5	0.519	0.3	LOS A	4.3	32.9	0.25	0.10	0.25	47.8
East: Fortune														
4	L2	89	0.0	104	0.0	0.182	4.5	LOS A	1.2	8.5	0.76	0.64	0.76	44.9
5	T1	10	0.0	12	0.0	0.182	4.5	LOS A	1.2	8.5	0.76	0.64	0.76	44.8
6	R2	36	0.0	42	0.0	0.182	4.5	LOS A	1.2	8.5	0.76	0.64	0.76	43.9
Approach		135	0.0	157	0.0	0.182	4.5	LOS A	1.2	8.5	0.76	0.64	0.76	44.6
North: Jeanne d'Arc														
7	L2	12	0.0	15	0.0	0.371	1.2	LOS A	2.4	17.1	0.49	0.30	0.49	47.6
8	T1	386	0.0	496	0.0	0.371	1.2	LOS A	2.4	17.1	0.49	0.30	0.49	47.4
9	R2	14	0.0	18	0.0	0.371	1.2	LOS A	2.4	17.1	0.49	0.30	0.49	46.4
Approach		412	0.0	529	0.0	0.371	1.2	LOS A	2.4	17.1	0.49	0.30	0.49	47.4
West: Vineyard														
10	L2	15	0.0	17	0.0	0.116	3.0	LOS A	0.7	5.1	0.68	0.52	0.68	47.0
11	T1	15	0.0	17	0.0	0.116	3.0	LOS A	0.7	5.1	0.68	0.52	0.68	46.8
12	R2	68	0.0	79	0.0	0.116	3.0	LOS A	0.7	5.1	0.68	0.52	0.68	45.8
Approach		98	0.0	114	0.0	0.116	3.0	LOS A	0.7	5.1	0.68	0.52	0.68	46.1
All Vehicles		1301	5.8	1643	5.9	0.519	1.1	LOS A	4.3	32.9	0.40	0.24	0.40	47.2

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

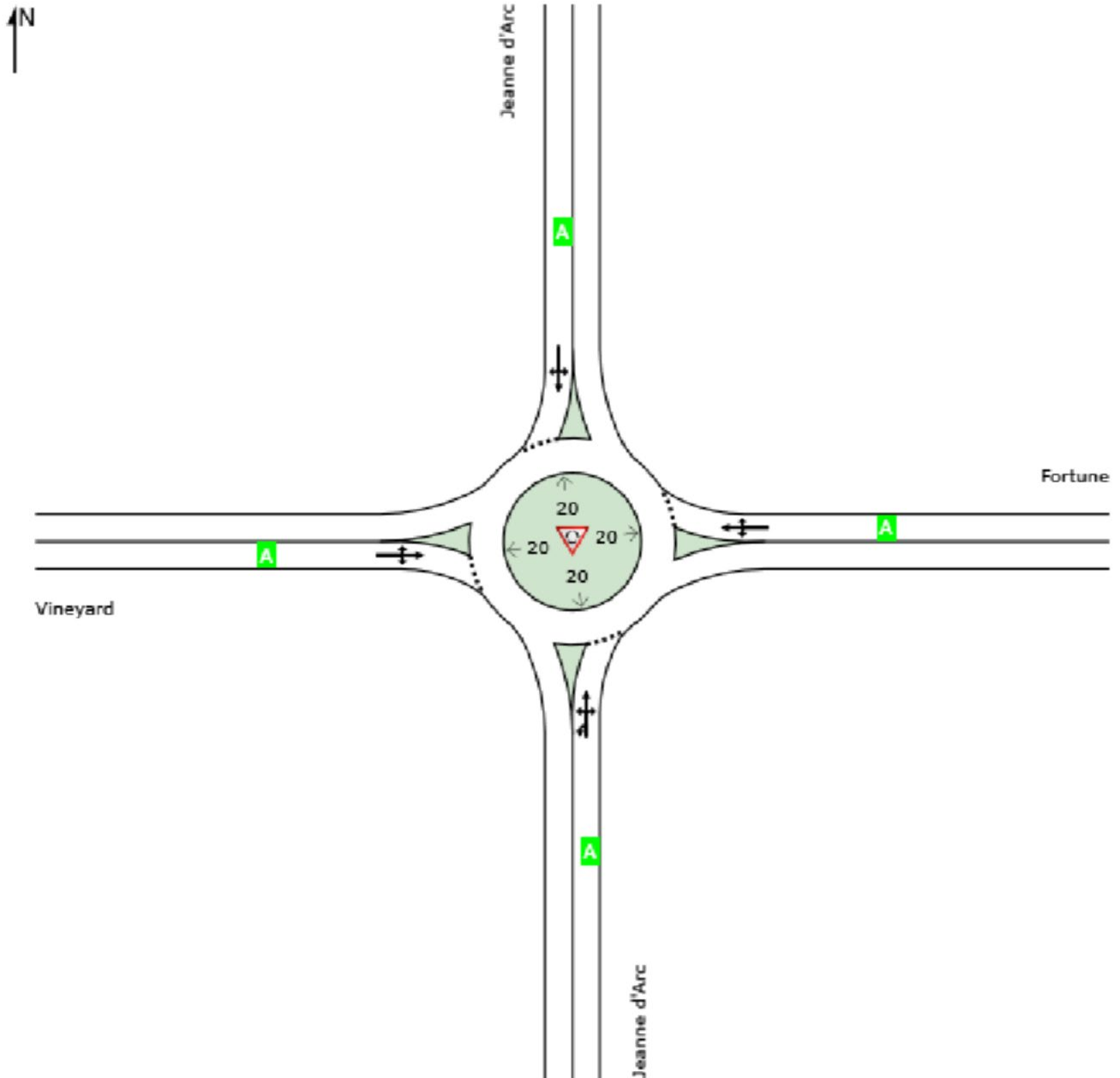**Site: 101 [Future AM Peak (Single) - Scenario 2 - Rev2 (Site Folder: Updated - 2023 Volume)]**
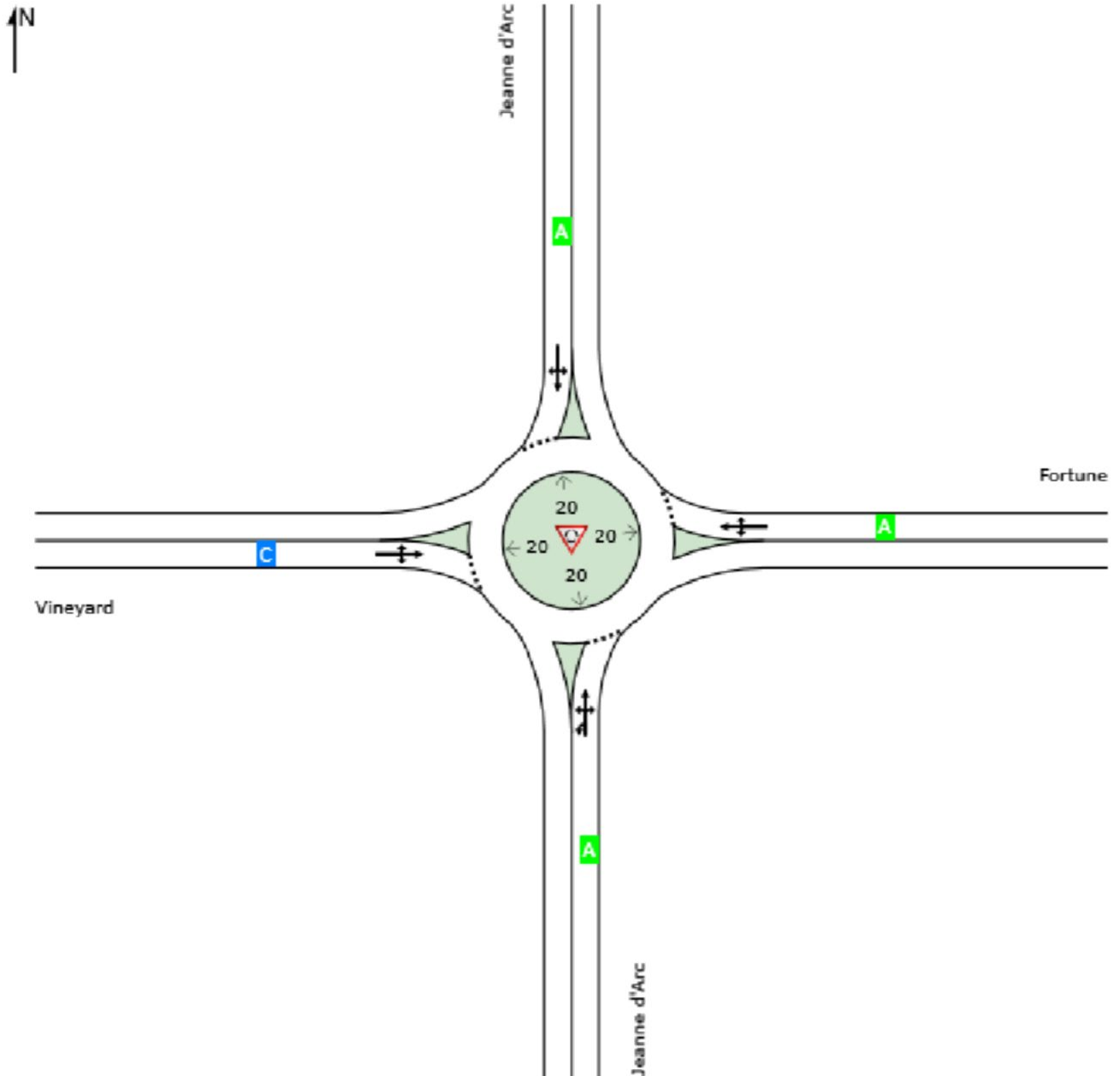
Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Vehicle Movement)): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	C	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

▼ Site: 101 [Future AM Peak (Single) - Scenario 2 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Level of Service Target (Worst Vehicle Movement)): Results for 20 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Jeanne d'Arc														
1u	U	20	100.0	28	100.0	0.253	0.2	LOS A	1.5	11.1	0.13	0.04	0.13	48.9
1	L2	12	1.9	17	1.9	0.253	0.1	LOS A	1.5	11.1	0.13	0.04	0.13	48.5
2	T1	218	1.6	309	1.6	0.253	0.1	LOS A	1.5	11.1	0.13	0.04	0.13	48.4
3	R2	49	4.3	69	4.3	0.253	0.1	LOS A	1.5	11.1	0.13	0.04	0.13	47.3
Approach		299	8.6	424	8.6	0.253	0.1	LOS A	1.5	11.1	0.13	0.04	0.13	48.2
East: Fortune														
4	L2	138	0.0	177	0.0	0.141	1.3	LOS A	0.8	5.3	0.45	0.30	0.45	45.7
5	T1	2	3.8	3	3.8	0.141	1.3	LOS A	0.8	5.3	0.45	0.30	0.45	45.5
6	R2	7	9.1	9	9.1	0.141	1.4	LOS A	0.8	5.3	0.45	0.30	0.45	44.6
Approach		147	0.5	189	0.5	0.141	1.3	LOS A	0.8	5.3	0.45	0.30	0.45	45.7
North: Jeanne d'Arc														
7	L2	13	0.0	18	0.0	0.795	2.9	LOS A	10.8	75.5	0.74	0.56	0.81	46.8
8	T1	803	0.0	1138	0.0	0.795	2.9	LOS A	10.8	75.5	0.74	0.56	0.81	46.6
9	R2	8	0.0	11	0.0	0.795	2.9	LOS A	10.8	75.5	0.74	0.56	0.81	45.6
Approach		824	0.0	1168	0.0	0.795	2.9	LOS A	10.8	75.5	0.74	0.56	0.81	46.6
West: Vineyard														
10	L2	1	0.0	1	0.0	0.441	25.5	LOS C	3.9	27.4	1.00	1.09	1.21	36.6
11	T1	8	14.0	10	14.0	0.441	26.7	LOS C	3.9	27.4	1.00	1.09	1.21	36.5
12	R2	89	0.0	114	0.0	0.441	25.5	LOS C	3.9	27.4	1.00	1.09	1.21	35.9
Approach		98	1.1	126	1.1	0.441	25.6	LOS C	3.9	27.4	1.00	1.09	1.21	36.0
All Vehicles		1368	2.0	1907	2.0	0.795	3.6	LOS A	10.8	75.5	0.60	0.45	0.65	46.0

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE LEVEL OF SERVICE

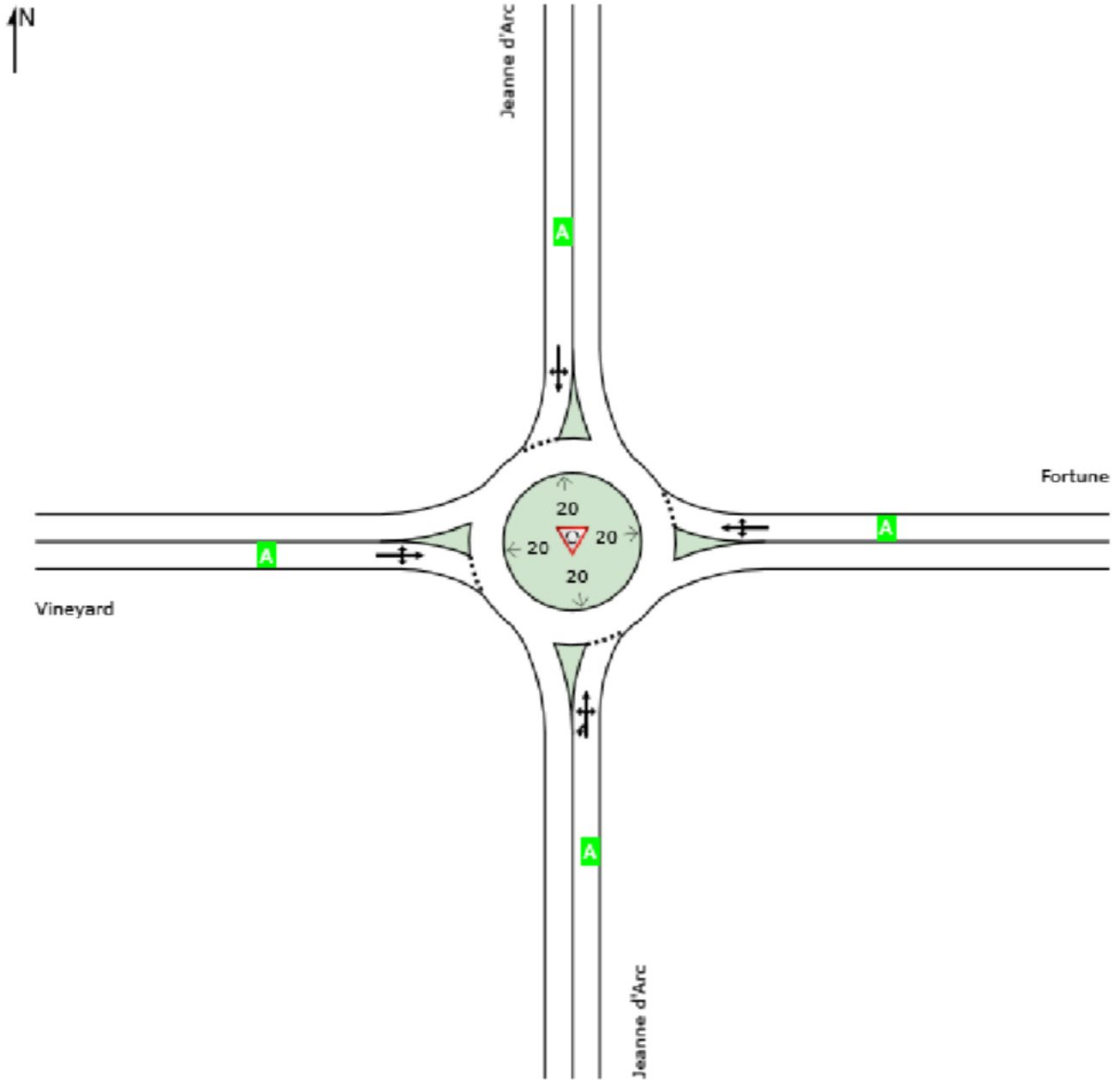## Site: 101 [Future PM Peak (Single) - Scenario 2 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

▼ Site: 101 [Future PM Peak (Single) - Scenario 2 - Rev2 (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 20 years

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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	20	100.0	28	100.0	0.576	0.6	LOS A	5.3	40.5	0.29	0.12	0.29	47.9
1	L2	94	22.2	133	22.2	0.576	0.3	LOS A	5.3	40.5	0.29	0.12	0.29	47.8
2	T1	459	6.0	651	6.0	0.576	0.3	LOS A	5.3	40.5	0.29	0.12	0.29	47.8
3	R2	83	8.3	118	8.3	0.576	0.3	LOS A	5.3	40.5	0.29	0.12	0.29	46.7
Approach		656	11.5	930	11.5	0.576	0.3	LOS A	5.3	40.5	0.29	0.12	0.29	47.6
East: Fortune														
4	L2	89	0.0	114	0.0	0.225	5.7	LOS A	1.6	11.1	0.83	0.72	0.83	44.3
5	T1	10	0.0	13	0.0	0.225	5.7	LOS A	1.6	11.1	0.83	0.72	0.83	44.2
6	R2	36	0.0	46	0.0	0.225	5.7	LOS A	1.6	11.1	0.83	0.72	0.83	43.3
Approach		135	0.0	173	0.0	0.225	5.7	LOS A	1.6	11.1	0.83	0.72	0.83	44.0
North: Jeanne d'Arc														
7	L2	12	0.0	17	0.0	0.420	1.4	LOS A	2.9	20.6	0.54	0.34	0.54	47.4
8	T1	386	0.0	547	0.0	0.420	1.4	LOS A	2.9	20.6	0.54	0.34	0.54	47.3
9	R2	14	0.0	20	0.0	0.420	1.4	LOS A	2.9	20.6	0.54	0.34	0.54	46.3
Approach		412	0.0	584	0.0	0.420	1.4	LOS A	2.9	20.6	0.54	0.34	0.54	47.2
West: Vineyard														
10	L2	15	0.0	19	0.0	0.140	3.6	LOS A	0.9	6.5	0.73	0.59	0.73	46.6
11	T1	15	0.0	19	0.0	0.140	3.6	LOS A	0.9	6.5	0.73	0.59	0.73	46.4
12	R2	68	0.0	87	0.0	0.140	3.6	LOS A	0.9	6.5	0.73	0.59	0.73	45.5
Approach		98	0.0	126	0.0	0.140	3.6	LOS A	0.9	6.5	0.73	0.59	0.73	45.8
All Vehicles		1301	5.8	1813	5.9	0.576	1.4	LOS A	5.3	40.5	0.45	0.28	0.45	47.0

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C TRANSPORTION
ANALYSIS -
Revised Analysis (LRT Growth Rates)

LANE LEVEL OF SERVICE

Site: 101 [Future AM Peak (Single) - LRT Growth Rates (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

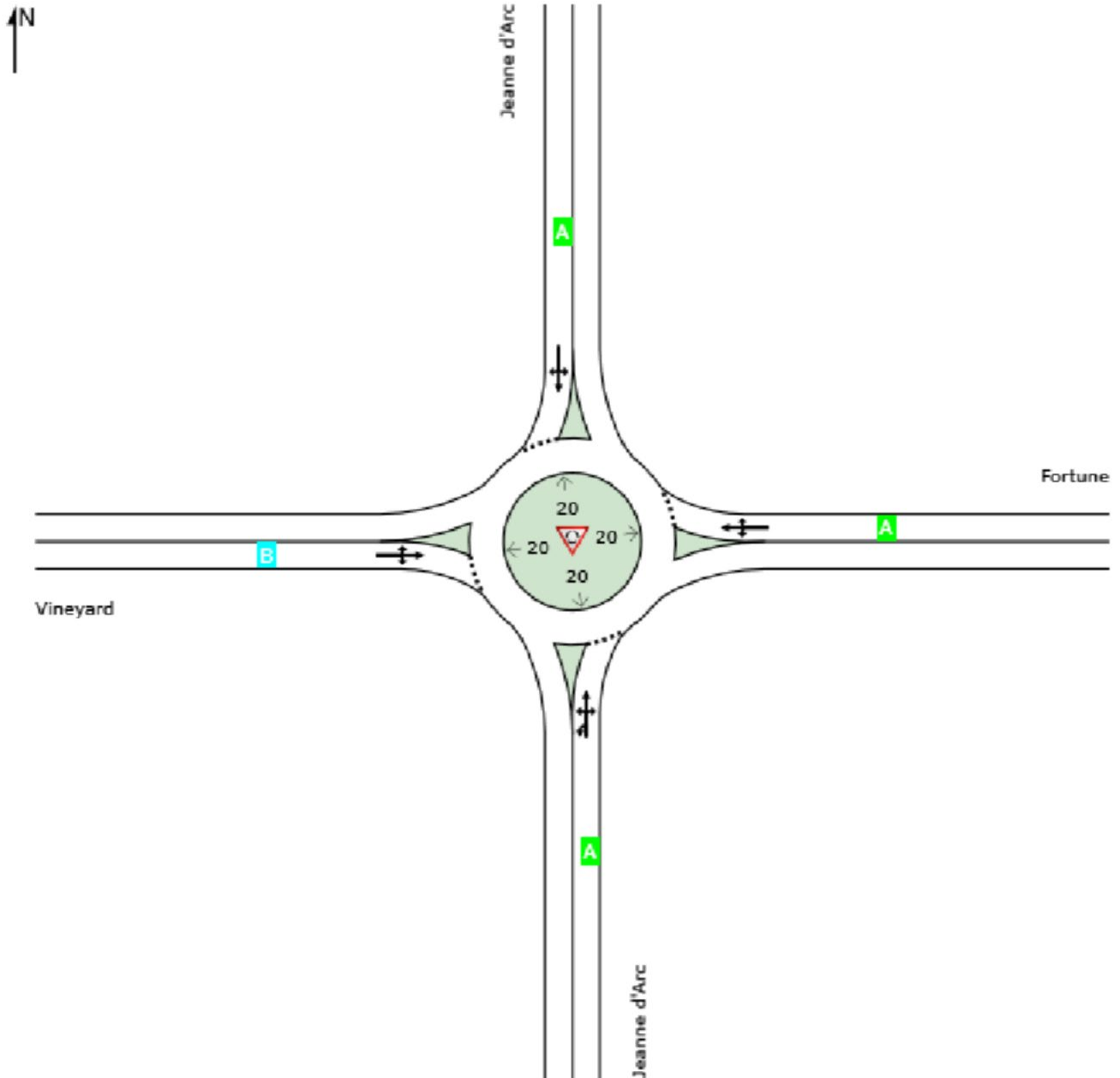## ▼ Site: 101 [Future AM Peak (Single) - LRT Growth Rates (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Jeanne d'Arc														
1u	U	31	100.0	33	100.0	0.228	0.2	LOS A	1.3	9.8	0.12	0.03	0.12	48.9
1	L2	15	1.9	16	1.9	0.228	0.1	LOS A	1.3	9.8	0.12	0.03	0.12	48.5
2	T1	258	1.6	272	1.6	0.228	0.1	LOS A	1.3	9.8	0.12	0.03	0.12	48.3
3	R2	58	4.3	61	4.3	0.228	0.1	LOS A	1.3	9.8	0.12	0.03	0.12	47.3
Approach		362	10.5	381	10.5	0.228	0.1	LOS A	1.3	9.8	0.12	0.03	0.12	48.2
East: Fortune														
4	L2	164	0.0	173	0.0	0.134	1.1	LOS A	0.7	4.9	0.43	0.28	0.43	45.8
5	T1	3	3.8	3	3.8	0.134	1.2	LOS A	0.7	4.9	0.43	0.28	0.43	45.6
6	R2	8	9.1	8	9.1	0.134	1.2	LOS A	0.7	4.9	0.43	0.28	0.43	44.6
Approach		175	0.5	184	0.5	0.134	1.1	LOS A	0.7	4.9	0.43	0.28	0.43	45.7
North: Jeanne d'Arc														
7	L2	16	0.0	17	0.0	0.696	1.7	LOS A	6.8	47.7	0.64	0.41	0.65	47.1
8	T1	951	0.0	1001	0.0	0.696	1.7	LOS A	6.8	47.7	0.64	0.41	0.65	46.9
9	R2	9	0.0	9	0.0	0.696	1.7	LOS A	6.8	47.7	0.64	0.41	0.65	46.0
Approach		976	0.0	1027	0.0	0.696	1.7	LOS A	6.8	47.7	0.64	0.41	0.65	46.9
West: Vineyard														
10	L2	1	0.0	1	0.0	0.294	12.5	LOS B	2.3	16.0	1.00	0.96	1.00	42.1
11	T1	9	14.0	9	14.0	0.294	13.3	LOS B	2.3	16.0	1.00	0.96	1.00	41.9
12	R2	106	0.0	112	0.0	0.294	12.5	LOS B	2.3	16.0	1.00	0.96	1.00	41.2
Approach		116	1.1	122	1.1	0.294	12.6	LOS B	2.3	16.0	1.00	0.96	1.00	41.3
All Vehicles		1629	2.5	1715	2.5	0.696	2.0	LOS A	6.8	47.7	0.53	0.35	0.53	46.6

Site Level of Service (LOS) Method: Delay (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 per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is not included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
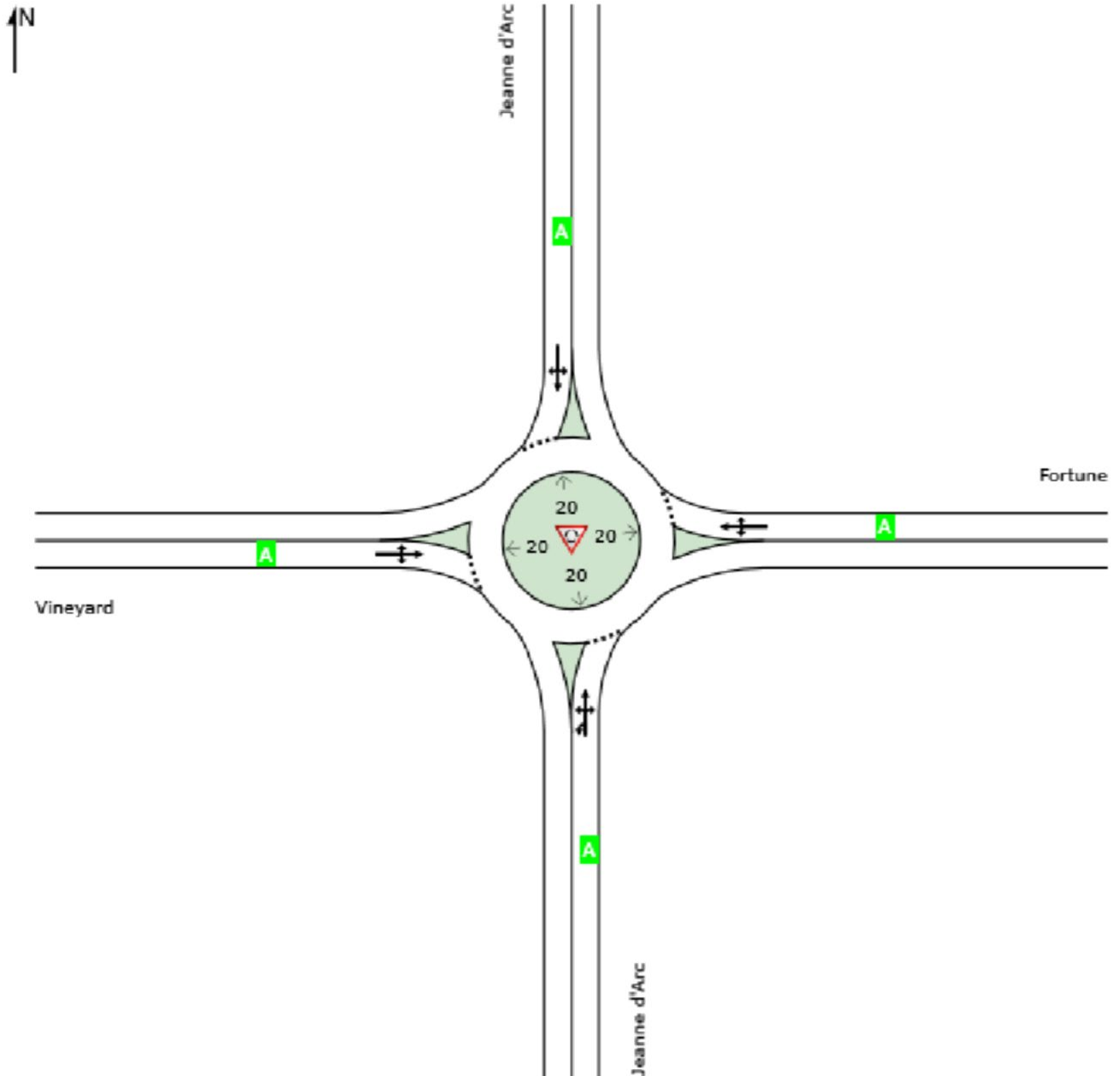
LANE LEVEL OF SERVICE

Site: 101 [Future PM Peak (Single) - LRT Growth Rates (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Delay Model: SIDRA Standard (Geometric Delay is not included).

MOVEMENT SUMMARY

▽ Site: 101 [Future PM Peak (Single) - LRT Growth Rates (Site Folder: Updated - 2023 Volume)]

Jeanne d'Arc and Fortune / Vineyard
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] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jeanne d'Arc														
1u	U	22	100.0	23	100.0	0.478	0.5	LOS A	3.7	28.5	0.24	0.10	0.24	48.0
1	L2	112	22.2	118	22.2	0.478	0.3	LOS A	3.7	28.5	0.24	0.10	0.24	47.9
2	T1	543	6.0	572	6.0	0.478	0.2	LOS A	3.7	28.5	0.24	0.10	0.24	47.9
3	R2	58	8.3	61	8.3	0.478	0.2	LOS A	3.7	28.5	0.24	0.10	0.24	46.8
Approach		735	11.5	774	11.5	0.478	0.3	LOS A	3.7	28.5	0.24	0.10	0.24	47.8
East: Fortune														
4	L2	105	0.0	111	0.0	0.188	4.3	LOS A	1.2	8.7	0.75	0.62	0.75	45.1
5	T1	11	0.0	12	0.0	0.188	4.3	LOS A	1.2	8.7	0.75	0.62	0.75	44.9
6	R2	43	0.0	45	0.0	0.188	4.3	LOS A	1.2	8.7	0.75	0.62	0.75	44.0
Approach		159	0.0	167	0.0	0.188	4.3	LOS A	1.2	8.7	0.75	0.62	0.75	44.8
North: Jeanne d'Arc														
7	L2	16	0.0	17	0.0	0.361	1.2	LOS A	2.4	16.5	0.49	0.30	0.49	47.6
8	T1	457	0.0	481	0.0	0.361	1.2	LOS A	2.4	16.5	0.49	0.30	0.49	47.4
9	R2	16	0.0	17	0.0	0.361	1.2	LOS A	2.4	16.5	0.49	0.30	0.49	46.4
Approach		489	0.0	515	0.0	0.361	1.2	LOS A	2.4	16.5	0.49	0.30	0.49	47.4
West: Vineyard														
10	L2	18	0.0	19	0.0	0.122	2.9	LOS A	0.8	5.4	0.67	0.51	0.67	47.0
11	T1	18	0.0	19	0.0	0.122	2.9	LOS A	0.8	5.4	0.67	0.51	0.67	46.8
12	R2	80	0.0	84	0.0	0.122	2.9	LOS A	0.8	5.4	0.67	0.51	0.67	45.8
Approach		116	0.0	122	0.0	0.122	2.9	LOS A	0.8	5.4	0.67	0.51	0.67	46.2
All Vehicles		1499	5.6	1578	5.6	0.478	1.2	LOS A	3.7	28.5	0.41	0.25	0.41	47.2

Site Level of Service (LOS) Method: Delay (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 per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is not included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.