

ANN ARBOR PUBLIC SCHOOLS (AAPS) LOGAN ELEMENTARY SCHOOL DEVELOPMENT MULTI-MODAL TRANSPORTATION IMPACT ANALYSIS (MTIA)

ANN ARBOR, MICHIGAN

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1 INTRODUCTION AND SUMMARY

1.1 PURPOSE OF REPORT AND STUDY OBJECTIVES

This memorandum presents the results of the Multi-Modal Transportation Impact Analysis (MTIA) for the proposed Ann Arbor Public School (AAPS) development in the City of Ann Arbor, Michigan. The AAPS has proposed changes to their existing school building that include:

- Relocating Logan Elementary School (ES) from the current location at the northwest quadrant of the intersection of Nixon Road & Traver Boulevard to the east side of Nixon Road adjacent to the existing Clague Middle School (MS). Site access for both Logan ES and Clague MS is proposed via one shared access driveway on Nixon Road, and/or an exit-only access on Bluett Drive. Additionally, bus queuing for Logan ES is proposed via a parking lane adjacent to the east side of Nixon Road, and for Clague MS it is provided via a parking lane on Bluett Drive. The site location is shown on the attached **Figure 1** and the proposed site plan is provided in **Appendix A**.
- Repurposing the “Old” Logan ES site as a temporary staging school for Martin Luther King ES while the existing King ES is undergoing reconstruction.

As part of the preliminary plan and site circulation review, the AAPS has required an MTIA for the proposed development. The scope of the study was developed based on Fleis & VandenBrink’s (F&V) understanding of the development program, accepted traffic engineering practice, and methodologies published by the Institute of Transportation Engineers (ITE) and Transportation Research Board (TRB), and as outlined in the City’s Unified Development Code.

The study analyses were completed using Synchro/SimTraffic (Version 11) traffic analysis software, the Highway Capacity Manual, 7th Edition (HCM7), and Highway Capacity Software, v2023 (HCS2023). Sources of data for this study include Quality Counts, LLC. (QC), Michigan Department of Transportation (MDOT), Washtenaw Area Transportation Study (WATS), and ITE.

1.2 EXECUTIVE SUMMARY

This MTIA includes an analysis of the existing transportation system, including vehicle and pedestrian analysis, as well as an evaluation of the anticipated future development in the study area. The specific types of studies undertaken as part of this MTIA includes the following:

1. **Vehicular Traffic Analysis** includes the calculation of the Existing, Background and Future vehicle delays, LOS, and queues at the study intersections during the weekday School AM and School PM peak hours.
2. **Pedestrian Analysis** includes the calculation of the Existing, Background and Future pedestrian LOS at the study intersections during the weekday School AM and School PM peak hours.
3. **Access Management** includes providing exhibits of the proposed and existing non-motorized facilities and interconnectivity, and proposing improvements and mitigation measures, if any, based on the review of the *City of Ann Arbor Crosswalk Design Guidelines*, *Highway Capacity Manual 7th Edition* and *USDOT Federal Highway Administration (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing*.
4. **Safety Evaluation** includes conducting crash and safety analysis at study intersections, performing a *Highway Safety Manual Analysis* to compare existing and proposed roundabout intersections on Nixon Road, reviewing *City of Ann Arbor A2 Vision Zero Plan*, evaluating intersection sight distance, reviewing Nixon Road for establishing school zone speed limit, and providing recommendations for safety improvements in the study network.
5. **Site Circulation Review** includes reviewing information regarding the existing and proposed school operations, calculating the stacking space needed for school Pick-Up/Drop-Off (PUDO) operations to ensure on-site vehicle accommodation without impacting adjacent streets, and providing recommendations to improve traffic operations and site circulation.

1.3 KEY FINDINGS

A. Existing Conditions

Vehicle Analysis

The results of the existing (2023) conditions vehicle analysis indicates that all of the study intersections approaches and movements are currently operating acceptably, at LOS D or better, during both School AM and School PM peak hours, with the following exceptions:

- Nixon Road & Meade Court/ Bluett Drive
- Nixon Road & W. Site Drive
- Nixon Road & Traver Boulevard

Pedestrian Analysis

The results of the existing (2023) conditions pedestrian analysis indicates that all uncontrolled crossings at study intersections are currently operating acceptably, at LOS D or better, with the exception of the SB approach at the following intersections:

- Nixon Road & Meade Court/Bluett Drive
- Nixon Road & W. Site Drive

B. Background Conditions

A conservative annual growth rate of **0.916%** per year was provided by WATS for use in this analysis to project the existing 2023 traffic volumes to the buildout year of 2027. Additionally, the background conditions analysis was conducted based on the City of Ann Arbor's planned improvements along Nixon Road.

Vehicle Analysis

The results of the background conditions vehicle analysis *without the proposed development* indicates that all approaches and movements at the study intersections are expected to operate acceptably at LOS D or better, with the following exceptions:

- Nixon Road & W. Site Drive: The WB approach is expected to operate at LOS F during School AM peak hour. However, review of SimTraffic microsimulations indicates acceptable operations with a 95th percentile queue length of approximately 130-ft (~5 vehicles) which is not significant.

Pedestrian Analysis

The results of the background conditions pedestrian analysis *without the proposed development* indicates that all evaluated uncontrolled crossings at the study intersections are expected to operate acceptably at LOS D or better, with the following exceptions:

- Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS E during both peak hours.
- Nixon Road & Traver Boulevard: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS F during both peak hours.

C. Future Conditions

Vehicle Analysis

- The future conditions vehicle analysis *with the proposed development* involved evaluating various scenarios to determine the most effective approach for future school operations. These scenarios included providing right-in/right-out (RIRO) only access via Nixon Road, additional exit-only access on Bluett Drive, addition of King ES staging trips, improvements on Nixon Road, and combining and separating Logan ES and Clague MS PUDO operations.
- The result of the evaluation indicates that all approaches and movements at study intersections, in all scenarios, are expected to continue operating acceptably in a manner similar to the background conditions analysis with minimal increases in delays, during both peak hours.

- This excludes the intersection of Nixon Road & W. Site Drive, which is expected operate at LOS E or worse, during all scenarios. However, the results indicates that separating the Logan ES and Clague MS PUDO operations by approximately 15-20 minutes would result in the least amount of delays and vehicles queuing at the egressing traffic at W. Site Drive, during both peak hours.

Pedestrian Analysis

- The results of the future conditions pedestrian analysis **with the proposed development** indicates that all evaluated uncontrolled crossings at the study intersections are expected to continue operating acceptably in a manner similar to the background condition pedestrian analysis with minimal increases in P_D during the studied School AM and School PM peak hours, with the following exceptions:
 - Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS E & F, respectively, during both peak hours.

D. Safety Review

- A crash analysis was conducted for all of existing study intersections for the most recent available five years crash data. The results of the analysis indicates that a total of 5 crashes were reported at or associated with the study intersections. Review of the detailed crash reports (UD-10s) indicates that no significant pattern of crashes was present. Additionally, there were no crashes reported with fatalities or any crashes with injuries.
- A safety review was performed for the study intersections according to the *Highway Safety Manual* (HSM) crash predictive methodology. With the construction of roundabout, the total crashes are predicted to decrease by approximately 45%.
- The City's comprehensive transportation plan, '*Ann Arbor Moving Together Toward Vision Zero*' was reviewed for additional planned multi-modal infrastructure that would have potential impacts on the study transportation network. The plan includes *Tier 3 Focus Corridor*, and *Minor & Local All Ages and Abilities (AAA) Bike Routes* in the study network which have been highlighted in the study.
- The review of Michigan Legislature Section 257.627a indicates A school zone speed limit may be decreased by not more than 20 miles per hour less than the speed limit normally posted but shall be not less than 25 miles per hour.
- The sight distance analysis performed at the study intersections indicates that adequate sight distance is provided, assuming the vision triangles highlighted in the study remain free of vegetation and parked vehicles.

E. Site Circulation Review

- The passenger vehicle PUDO queue lengths associated with Logan ES & Clague MS were calculated based on future student enrollment at both schools. The results of the evaluation indicates that, at least 875-feet (35 vehicles) and 575-feet (23 vehicles) of vehicle stacking space are needed to accommodate PUDO operations for Logan ES & Clague MS, respectively.
- The site plan has been designed to accommodate the projected vehicle queuing on site and is not expected to impact the operations on Nixon Road. The site circulation plan for both schools is shown in the attached **Figure 9A**.

F. Improvement Analysis

Pedestrian Analysis

- The review of the City of Ann Arbor's Crosswalk Design Guidelines, HCM 7th Edition and *USDOT Federal Highway Administration (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing* provides various improvements at the failing uncontrolled crossings which have been evaluated in *HCS 2023 TWSC Module* as highlighted below in the recommendations.
- The results of the future conditions pedestrian analysis **with the proposed improvements**, indicates that with the implementation of the proposed improvements all evaluated failing uncontrolled crossings at the study intersections are expected to operate at LOS D or better with significant improvement in pedestrian dissatisfaction ratings, during both peak periods.

G. Recommendations

The following mitigation measures are recommended for the proposed development plan. These recommendations are further illustrated in **Figure 9B**.

Table E1: Logan ES Recommended Improvements

	Intersection	Approach	Recommended Improvements
1	Nixon Road & Meade Court/Bluett Drive	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).
3	Nixon Road & Traver Boulevard	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).

1.4 CONCLUSIONS

- The results and recommendation of this MTIA indicates that the proposed development can be accommodated within the existing transportation network. Implementation of the identified mitigation measures is recommended to improve the safety and Q/LOS for the existing, background and proposed site generated trips.

2 PROPOSED DEVELOPMENT

2.1 BACKGROUND DEVELOPMENT

Washtenaw Area Transportation Study (WATS) is the multi-jurisdictional agency responsible for the transportation planning in Washtenaw County. WATS maintains the area transportation planning models and provides information regarding projected growth rates along roadways throughout their jurisdiction. F&V contacted WATS to obtain a background growth rate for use in this study. The WATS travel demand forecast model indicated a **0.916%** growth rate for the project area compounded annually from 2015 to 2040; therefore, this growth rate was utilized to project the existing 2023 traffic volumes to the site buildout year of 2027.

It is also important to account for traffic that will be generated by developments within the vicinity of the study area that are currently under construction or will be within the buildout year. At the time of this study, no planned background developments were identified by the AAPS, within the vicinity of the project site.

2.2 PROPOSED DEVELOPMENT PLAN

The proposed project includes Ann Arbor Public Schools (AAPS) developments in the City of Ann Arbor. The AAPS has proposed changes to their existing school buildings that include:

- Relocating Logan Elementary School (ES) from the current location at the northwest quadrant of the intersection of Nixon Road & Traver Boulevard to the east side of Nixon Road adjacent to the existing Clague Middle School (MS). Site access for both Logan ES and Clague MS is proposed via one shared access driveway on Nixon Road, **and/or an exit-only access on Bluett Drive**. Additionally, bus queuing for Logan ES is proposed via a parking lane adjacent to the east side of Nixon Road, and for Clague MS it is provided via a parking lane on Bluett Drive. The site location is shown on the attached **Figure 1** and the proposed site plan is provided in **Appendix A**.
- Repurposing the “Old” Logan ES site as a temporary staging school for Martin Luther King ES while the existing King ES is undergoing construction.

3 EXISTING AREA CONDITIONS

3.1 STUDY AREA AND LAND USES

- The study area for this project was determined based upon conversations with the AAPS and includes the intersections and roadways immediately adjacent to the proposed development location. The impacts to the study network that were evaluated include vehicle, pedestrian, bicycle, and bus infrastructure. The study area considered in this evaluation is shown on **Figure 1**.
- The study area is characterized by institutional, commercial, and residential zones. These include land uses such as schools, single-family homes, townhouses, apartment buildings, restaurants, and retail shops. The site location and the adjacent land uses are shown on **Figure 2**.

3.2 SITE ACCESSIBILITY

The study area around the proposed development is served by several major roadways, and has public transit, pedestrian, and bicycle facilities in place.

The existing non-motorized facilities and interconnectivity to the proposed site are shown on the attached **Figure 3**, indicating all possible points of conflict between motorized traffic and pedestrian/bicycle traffic on the study roadways as well as transit stop locations, adjacent to the project site.

3.3 VEHICLE AND NON-MOTORIZED INFRASTRUCTURE

The existing and proposed lane use and traffic control at the study intersections are shown on the attached **Figure 4** and the study roadways and transit facilities along the studied roadways are further described below. For the purposes of this study, residential streets were assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted.

Nixon Road runs in the north and south directions adjacent to the west side of the proposed project site. The study section of Nixon Road is under the jurisdiction of the City of Ann Arbor, is classified as a *Major Collector*, a posted speed limit of 30 mph, and an *Annual Average Daily Traffic (AADT)* volume of approximately 8,090 vehicles per day (MDOT 2022), north of Aurora Street. The study section of roadway provides a two-lane cross-

section, with one (1) lane of travel in each direction. Additionally, Nixon Road provides a left-turn lane in southbound direction at the intersection with Clague Street and with Bluett Drive/ Meade Court, and a left-turn lane in northbound direction at the intersection with Traver Boulevard.

Bluett Drive generally runs in the east and west direction adjacent to the south of the proposed project site. The study section of Bluett Drive is under the jurisdiction of the City of Ann Arbor, is classified as a *Local Road*, and has a posted speed limit of 25 mph. The study section of roadway provides a two-lane cross-section, with one (1) lane of travel in each direction.

Argonne Drive generally runs in the east and west direction adjacent to the north side of the proposed project site. The study section of Argonne Drive is under the jurisdiction of the City of Ann Arbor, is classified as a *Local Road*, and has a posted speed limit of 25 mph. The study section of roadway provides a two-lane cross-section, with one (1) lane of travel in each direction.

Traver Boulevard runs in the east and west direction adjacent to the west side of the proposed project site. The study section of Traver Boulevard is under the jurisdiction of the City of Ann Arbor, is classified as a *Local Road*, and has a posted speed limit of 25 mph. The study section of roadway provides a two-lane cross-section, with one (1) lane of travel in each direction.

3.4 TRANSIT FACILITIES

The transit routes that serve the proposed development location are summarized below and provided in **Appendix A**.

Route 22: Pontiac-Dhu Varren – Travels from Blake Transit Center to Pierpont Commons, with schedule stops at Beakes & Summit, Arrowwood Hills, Dhu Varren & Omlesaad, and Plymouth Mall. There are bus stops on this route on Nixon Road & Traver Boulevard to the west of the proposed Logan ES project site.

Route 23: Plymouth – Travels from Blake Transit Center to Green Rd Park & Ride, with scheduled stops at U-M Central Campus Transit Center, U-M Hospital, Plymouth & Barton, Plymouth Mall, Green & Nixon, and Plymouth Rd Park & Ride. There are bus stops on this route on Nixon Road to the west of the proposed Logan ES project site.

3.5 CITY OF ANN ARBOR COMPREHENSIVE TRANSPORTATION PLAN

The City of Ann Arbor has developed several comprehensive planning initiatives such as A2 Moving Together (transportation plan), A2Zero (carbon neutrality plan), Treeline master plan, and All Ages and Abilities (AAA) plan that are aimed at creating a more sustainable and equitable city.

- The **A2 Moving Together** aims to create a safer and more efficient transportation system by implementing the Vision Zero strategy to eliminate traffic fatalities and injuries by 2025, as well as promoting alternative modes of transportation.
- The **A2Zero** plan acknowledges the importance of transportation systems in contributing to greenhouse gas emissions and aims to achieve carbon neutrality by 2030 through a focus on renewable energy sources and sustainable transportation.
- The **Treeline Master Plan** is a proposed urban trail that aims to provide safe and convenient non-motorized travel between cultural and recreational sites, connecting with both the county-wide Border-to-Border Trail and state-wide Iron Bell Trail.
- The **All Ages and Abilities (AAA)** plan aims to create a more inclusive and accessible community by improving transportation infrastructure. It focuses on enhancing pedestrian and cycling infrastructure, implementing traffic calming measures, and providing equitable access for people of all ages and abilities.

These plans have become integral parts of the city's Capital Improvement Plan 2024-2029 (CIP), which allocates funding for the city's proposed capital projects and infrastructure improvements over a multi-year period. The CIP programmed improvements within the study area that will coincide with the proposed development are described in detail below.

- **Nixon Road** is scheduled for improvements (Bluett Drive to Dhu Varren Road/ Green Road) during 2026-2027, which includes incorporating roundabouts at Bluett Drive and Traver Boulevard, a new

median, a buffered bicycle lane in both directions, lighting and landscape improvements, and watermain and stormwater management improvements.

- **Traver Boulevard** is scheduled for resurfacing (Tuebingen Parkway to Nixon Road) beyond 2029, which also includes implementing All Ages and Abilities (AAA) bike corridor.

3.6 EXISTING TRAFFIC VOLUMES

Quality Counts (QC) collected existing Turning Movement Count (TMC) data, including vehicles, pedestrians and bicycles on Tuesday, April 11, 2023, during the School AM peak (7:00AM to 9:00AM) and School PM peak (2:15PM to 4:15 PM) periods, at the following study intersections:

- Nixon Road & Argonne Drive
- Nixon Road & Traver Boulevard
- Nixon Road & Clague Street
- Nixon Road & Meade Court/ Drive
- Traver Boulevard & Logan ES W. Driveway
- Traver Boulevard & Logan ES E. Driveway
- Clague Street & Clague MS W. Circle Driveway
- Clague Street & Clague MS E. Circle Driveway
- Clague Street & Access to Bluett Drive
- Clague Street & Bluett Drive

The weekday overall, School AM and School PM peak hours for the adjacent roadway network were observed to generally occur (7:45 AM to 8:45 AM) & (3:00 PM to 4:00 PM), respectively.

F&V collected an inventory of existing lane use and traffic controls, as shown on the attached **Figure 4**. The existing 2023 traffic volume were utilized in this evaluation and the overall peak hour traffic volumes for vehicles, and pedestrians & bicycles are provided in the attached **Figures 5A & 5B**.

4 PROJECTED OVERALL SITE TRAFFIC OF ALL MODES

4.1 TRIP GENERATION

The proposed development plans to increase existing enrollment at Logan ES from 362 students to 600 students. The number of weekday School AM and School PM peak hour multi-modal trips that would be generated by the proposed development was forecasted based on the existing (2023) peak hour volumes collected at the school site with adjustments made to account for the increase in student enrollment at the school. The resulting multi-modal trip generation for the proposed development are summarized in **Table 1**.

Table 1: Multi-modal Trip Generation Summary

Land Use	Modal Split	School AM Peak Hour			School PM Peak Hour		
		In	Out	Total	In	Out	Total
Logan Elementary School	Vehicle Trips (PC)*	275	209	484	134	172	306
	Pedestrian	113	22	135	126	167	293
	Buses	13	13	26	8	8	16
	Bike	71	23	94	108	61	169
	Total Trips	472	267	739	376	408	784

NOTE: *PC = "Passenger Cars".

A. Clague Middle School

The proposed Logan ES will share vehicular access via W. Site Drive with the existing Clague Middle School (MS). An overlap of 15-20 minutes exists between the planned PUDO operations of Logan ES and Clague MS. This could potentially result in concurrent passenger vehicle PUDO operations for both schools on W. Site Drive. Therefore, the weekday School AM and School PM peak hours trips associated with Clague MS were calculated based on the existing (2023) peak hour volumes collected at the school site with adjustments made to account for the increase in traffic volumes based on the buildout year 2027. The resulting passenger vehicle trip generation are summarized in **Table 2**.

Table 2: Clague MS Passenger Vehicle Trip Generation Summary

Land Use	School AM Peak Hour (vph)			School PM Peak Hour (vph)		
	In	Out	Total	In	Out	Total
Clague Middle School	286	240	526	85	147	232

B. King Elementary School

The proposed development plans to repurpose the “Old” Logan ES site as a temporary staging school for Martin Luther King ES while the existing King ES is undergoing construction. The AAPS plans to utilize a fleet of nine buses to transport students from King ES to the “Old” Logan ES site and return them to King ES at the conclusion of the school day. Therefore, the traffic volume generated by these buses were added into the study roadway network based on the potential route connecting King ES and “Old” Logan ES site.

4.2 TRIP DISTRIBUTION

The trips that would be generated by the proposed development were assigned to the study roadway network based on the proposed site access plan, the existing peak hour traffic pattern in the adjacent roadway, and the methodologies published by ITE. The resulting site-generated and redistributed peak hour vehicle, and pedestrian and bicycle traffic volumes for Logan ES are shown in **Figures 7A & 7B**. Additionally, the site-generated and/or redistributed peak hour vehicle traffic volumes for Clague MS are shown in **Figure 7C**, and for King ES in **Figure 7D**, respectively.

4.3 TOTAL TRAFFIC

The background traffic volumes, and proposed development trip generation were combined to calculate the total peak hour volumes. The resulting future peak hour vehicle volumes for various scenarios are shown in **Figures 8A-8F**, and resulting pedestrian and bicycle traffic volumes are shown in **Figure 8G**.

5 TRANSPORTATION ANALYSIS

5.1 CAPACITY AND QUALITY/LEVEL OF SERVICE METHODOLOGY

5.1.1 Vehicle Q/LOS

The vehicular traffic volume analysis was evaluated using Synchro (Version 11) based on the methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM). The Level of Service (LOS) determination criteria for LOS “A” through “F” are provided in **Appendix A** for signalized and unsignalized intersections. Typically, LOS “D” is considered acceptable, with LOS “A” representing minimal delay, and LOS “F” indicating failing conditions.

5.1.2 Pedestrian Q/LOS

Highway Capacity Manual 7th Edition provides separate criteria for assessing pedestrian Q/LOS at signalized/unsignalized intersections and urban street segments. HCM7th Edition does not provide methodology to evaluate pedestrian analysis at roundabout intersections. However, HCM7th Edition provides methodology to evaluate the quality of service provided to pedestrians traveling through Two-Way Stop-Controlled (TWSC) intersection which can also be utilized for evaluating pedestrian analysis at roundabout intersections. These methodologies are included into the most recent version of the Highway Capacity Software (HCS2023) TWSC module. Therefore, the pedestrian facilities at the studied unsignalized TWSC and roundabout intersections are evaluated using the HCS 2023 TWSC module. HCM7th Edition provides specific methodology for evaluating pedestrian facilities at uncontrolled/controlled approaches as described below:

- **Uncontrolled Approach:** Pedestrian satisfaction level and LOS at TWSC intersection are outlined in the HCM7 methodology for evaluating crossings at an uncontrolled approach of a TWSC intersection or at a midblock location.
- **Controlled Approach:** At TWSC intersections, HCM7 considers that pedestrians crossing at these locations, the stop-controlled traffic are assumed to Stop to through pedestrians, resulting in negligible delays for pedestrians.

Therefore, only *uncontrolled approaches* can be evaluated at the stop-controlled study intersections to determine pedestrian satisfaction level and LOS.

The Q/LOS determination criteria for LOS “A” through “F” are provided in **Appendix A** for two-way stop-controlled (TWSC) intersections. Typically, LOS “D” is considered acceptable, with LOS “A” representing minimal dissatisfaction, and LOS “F” indicating failing conditions.

5.1.3 Bicycle Q/LOS

Highway Capacity Manual 7th Edition provides separate criteria for assessing bicycle Q/LOS at signalized/unsignalized intersections and urban street segments. However, HCM7th Edition does not provide methodology to evaluate bicycle analysis at unsignalized intersections, as few data are available in the United States to support model calibration or LOS determination, as provided in the **Appendix A**. Therefore, bicycle facilities at unsignalized intersections in the study area were not evaluated.

5.2 CAPACITY AND QUALITY/LEVEL OF SERVICE ANALYSIS

5.2.1 Existing Conditions

A. Vehicle Analysis

The results of the existing conditions vehicle analysis are included in **Appendix B** and summarized in **Table 3**. These results indicate that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better, during the studied School AM and School PM peak hours, with the exception of the following:

Nixon Road & Meade Court/Bluett Drive

- During the School AM peak hour: The westbound approach is currently operating at LOS F.
- During the School PM peak hour: The westbound approach is currently operating at LOS E.

Although the Synchro intersection LOS analysis indicates poor/failing operations for the westbound approach during both peak hours, review of SimTraffic network simulations indicates acceptable operations. The vehicles queues on the stop-controlled approach were observed to find adequate gaps within the through traffic and dissipate quickly during both peak periods.

Nixon Road & W. Site Drive

- During the School AM peak hour: The westbound approach is currently operating at LOS F.

Although the Synchro intersection LOS analysis indicates poor/failing operations for the westbound approach during School AM peak hour, review of SimTraffic network simulations indicates generally acceptable operations. Occasional periods of vehicle queues were observed on the westbound approach, however; these vehicle queues were observed to find adequate gaps within the through traffic and were not present throughout the peak period.

Nixon Road & Traver Boulevard

- During the School AM peak hour: The eastbound approach is currently operating at LOS F.
- During the School PM peak hour: The eastbound approach is currently operating at LOS E.

Although the Synchro intersection LOS analysis indicates poor/failing operations for the eastbound approach during both peak hours, review of SimTraffic microsimulations indicates acceptable operations with a 95th percentile queue length of approximately 117-ft (4-5 vehicles) which is not significant.

Table 3: Existing Intersection Vehicle Operations

Intersection	Control	Approach	Existing Conditions			
			School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	EB	15.6	C	13.8	B
		WB	162.5	F	41.0	E
		NBL	9.0	A	8.0	A
		SBL	8.9	A	9.0	A

	Intersection	Control	Approach	Existing Conditions			
				School AM Peak		School PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
2	Nixon Road & W. Site Drive	Stop (Minor)	WB	177.5	F	28.2	D
			NB	Free			
			SBL	10.2	B	9.1	A
3	Nixon Road & Traver Boulevard	Stop (Minor)	EB	97.6	F	41.4	E
			NBL	11.3	B	8.8	A
			SB	Free			
4	Nixon Road & Argonne Drive	Stop (Minor)	WB	22.1	C	19.9	C
			NB	Free			
			SBL	8.6	A	9.2	A

B. Pedestrian Analysis

The results of the existing conditions pedestrian analysis at the uncontrolled crossings at the unsignalized intersections are included in **Appendix B** and summarized in **Table 4**. These results indicate that all evaluated uncontrolled crossings at the study intersections are currently operating acceptably, at LOS D or better, during the studied School AM and School PM peak hours, with the following exceptions:

Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossing at southbound approach is currently operating at LOS E during both peak hours.

Nixon Road & W. Site Drive: The uncontrolled crossing at southbound approach is currently operating at LOS E during both peak hours.

Table 4: Existing Unsignalized Intersection Pedestrian Operations

	Intersection	Control	Approach	Existing Conditions			
				School AM Peak		School PM Peak	
				P _D	LOS	P _D	LOS
1	Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	NB	0.000*	A	0.000*	A
			SB	0.386	E	0.352	E
2	Nixon Road & Clague Street	Stop (Minor)	NB	0.788*	F	0.000*	A
			SB	0.413	E	0.351	E
3	Nixon Road & Traver Boulevard	Stop (Minor)	NB	0.000*	A	0.000*	A
			SB	0.000*	A	0.000*	A
4	Nixon Road & Argonne Drive	Stop (Minor)	NB	0.000*	A	0.000*	A
			SB	0.000*	A	0.000*	A

* Indicates one (1) or no pedestrian volume present. *Note:* P_D = Proportion of pedestrians giving a "dissatisfied" rating or worse.

5.2.2 Background Conditions

An annual background traffic growth rate of **0.916%** per year provided by WATS was applied to the existing 2023 peak hour motorized & non-motorized traffic volumes shown on the attached **Figures 5A & 5B**, respectively, in order to determine the background 2027 peak hour traffic volumes shown on the attached **Figures 6A & 6B**. Background peak hour vehicular and non-motorized traffic operations were evaluated based on the proposed lane use and traffic control shown on the attached **Figure 4**, the background peak hour traffic volumes shown on the attached **Figures 6A & 6B**, and the methodologies presented in the HCM. The results of the analysis of background conditions are included in **Appendix C** and are summarized below for vehicular and non-motorized operations.

A. Vehicle Analysis

The results of the background conditions vehicle analysis **without the proposed development** are included in **Appendix C** and summarized in **Table 5**. These results indicates that all approaches and movements at the study intersections are expected to operate at LOS D or better during both peak periods, with the following exceptions:

Nixon Road & W. Site Drive

During the School AM peak hour: The westbound approach is expected to continue operating at LOS F.

Although the Synchro analysis indicates poor/failing operations for the westbound approach during School AM peak hour, review of SimTraffic microsimulations indicates acceptable operations with a 95th percentile queue length of approximately 130-ft (~5 vehicles) which is not significant.

Table 5: Background Intersection Vehicle Operations

Intersection	Control	Approach	Existing Conditions				Background Conditions				Difference			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	EB	15.6	C	13.8	B	2.5	A	0.0	A	-13.1	C→A	-13.8	B→A
		WB	162.5	F	41.0	E	4.5	A	4.5	A	-158.0	F→A	-36.6	E→A
		NBL/ NB	8.9	A	8.0	A	5.2	A	5.5	A	-3.7	-	-2.5	-
		SBL/ SB	8.9	A	9.0	A	7.5	A	4.2	A	-1.4	-	-4.7	-
2 Nixon Road & W. Site Drive	Stop (Minor)	WB	177.5	F	28.2	D	61.4	F	18.5	C	-116.1	-	-9.7	D→C
		NB	Free				Free				N/A			
		SBL/SB	10.2	B	9.1	A	Free				N/A			
3 Nixon Road & Traver Boulevard	Stop (Minor)	EB	97.6	F	41.4	E	5.0	A	4.2	A	-92.6	F→A	-37.2	E→A
		NBL/ NB	11.3	B	8.8	A	6.2	A	6.4	A	-5.2	B→A	-2.5	-
		SB	Free				9.7	A	4.8	A	N/A			
4 Nixon Road & Argonne Drive	Stop (Minor)	WB	22.1	C	19.9	C	23.4	C	20.8	C	1.3	-	0.9	-
		NB	Free				Free				N/A			
		SBL	8.6	A	9.2	A	8.7	A	9.3	A	0.1	-	0.1	-

**Decreased delays are the result of HCM weighting methodology, proposed lane use and traffic control and/or improved progression.*

B. Pedestrian Analysis

The results of the background conditions pedestrian analysis at unsignalized intersection uncontrolled crossings **without the proposed development** are included in **Appendix C** and summarized in **Table 6**. These results indicate that all evaluated uncontrolled crossings at the study intersections are expected to continue operating acceptably in a manner similar to the existing conditions analysis during both peak hours, with the following exceptions:

Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at northbound and southbound approaches are expected to operate at LOS E during both peak hours.

Nixon Road & Traver Boulevard: The uncontrolled crossings at northbound and southbound approaches are expected to operate at LOS F during both peak hours.

Table 6: Background Unsignalized Intersection Pedestrian Operations

Intersection	Control	Approach	Existing Conditions				Background Conditions				Difference				
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak		
			P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	
1	Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	NB	0.000*	A	0.000*	A	0.467	E	0.422	E	0.467	A→E	0.422	A→E
			SB	0.386	E	0.352	E	0.406	E	0.360	E	0.020	-	0.008	-
			EB	N/A				0.133	B	0.126	B	N/A			
			WB	N/A				0.248	C	0.227	C	N/A			
2	Nixon Road & W. Site Drive	Stop (Minor)	NB	0.788*	F	0.000*	A	N/A				N/A			
			SB	0.413	E	0.351	E	N/A				N/A			
3	Nixon Road & Traver Boulevard	Stop (Minor)	NB	0.000*	A	0.000*	A	0.588	F	0.550	F	0.588	A→F	0.550	A→F
			SB	0.000*	A	0.000*	A	0.558	F	0.522	F	0.558	A→F	0.522	A→F
			EB	N/A				0.243	C	0.229	C	N/A			
4	Nixon Road & Argonne Drive	Stop (Minor)	NB	0.000*	A	0.000*	A	0.000*	A	0.000*	A	0.000*	-	0.000*	-
			SB	0.000*	A	0.000*	A	0.000*	A	0.000*	A	0.000*	-	0.000*	-

* Indicates one (1) or no pedestrian volume present. Note: P_D = Proportion of pedestrians giving a "dissatisfied" rating or worse.

5.2.3 Future Conditions

A. Vehicle Analysis

The future conditions vehicle analysis *with the proposed development* involved evaluating various scenarios to determine the most effective approach for future school operations. These scenarios included providing right-in/right-out (RIRO) only access via Nixon Road, additional exit-only access on Bluett Drive, addition of King ES staging trips, improvements on Nixon Road, and combining and separating Logan ES and Clague MS PUDO operations. The summary of all evaluated scenarios is provided below:

Table 7. Summary of Future Conditions Vehicle Analysis Scenarios

Future Conditions Analysis Scenarios	
1.	Combined Logan ES & Clague MS Operations with RIRO only access on Nixon Road.
	A. No inclusion of King ES staging trips.
	B. Addition of King ES staging trips.
C.	Addition of King ES staging trips, with the following improvements: <ul style="list-style-type: none"> Addition of NB left-turn slip lane at Nixon Road & Traver Boulevard intersection. Addition of NB right-turn lane at Nixon Road & W. Site Drive intersection.
2.	Combined Logan ES & Clague MS Operations with RIRO only access on Nixon Road & exit-only access on Bluett Drive.
	A. No inclusion of King ES staging trips.
	B. Addition of King ES staging trips.
C.	Addition of King ES staging trips, with the following improvements: <ul style="list-style-type: none"> Addition of NB left-turn slip lane at Nixon Road & Traver Boulevard intersection. Addition of NB right-turn lane at Nixon Road & W. Site Drive intersection.
3.	Separate Logan ES & Clague MS Operations with RIRO only access on Nixon Road.
	A. Logan ES only.
B.	Clague MS only.

The results of the future conditions vehicle analysis for **Scenario # 1 (A-C)** are included in **Appendix D** and summarized in **Table 8**. The results for **Scenario # 1 (A)** are based on future volumes shown in **Figure 8A**, and the results for **Scenario # 1 (B-C)** are based on future volumes shown in **Figure 8B**. These results indicates that all approaches and movements at the study intersections in all scenarios are expected to continue operating acceptably in a manner similar to the background conditions vehicle analysis during both peak periods, with minimal increases in delays, with the following exceptions:

Scenario # 1A

- Nixon Road & W. Site Drive: The westbound approach is expected to operate at LOS F with significant increases in delays during both peak hours.

Review of SimTraffic microsimulation indicates prolonged vehicle queues on the westbound approach, lasting for approximately 20-minutes during School AM peak hour and most of School PM peak hour. Vehicles were frequently observed waiting for a substantial amount of time to find a suitable gap within the flow of through traffic on northbound Nixon Road.

Scenario # 1B

- Nixon Road & W. Site Drive: The westbound approach is expected to continue operating at LOS F similar to Scenario # 1A operations during both peak periods, with minimal increases in delays due to addition of King ES staging trips.

Review of SimTraffic microsimulation indicates similar vehicular operation as observed during Scenario # 1A with minimal increases in vehicle queuing.

Scenario # 1C

- Nixon Road & W. Site Drive: The westbound approach is expected to continue operating at LOS F during both peak periods as observed in previous scenarios. However, significant decreases in delays are expected during both peak periods, with the addition of the evaluated improvements on Nixon Road.

Review of SimTraffic indicates prolonged vehicle queues on the westbound approach, lasting for approximately 20-minutes during School AM peak hour, and approximately 30-minutes during School PM peak hour.

Table 8: Future Intersection Vehicle Operations Scenario # 1 (A-C)

Intersection	Control	Approach	Future Conditions (Scenario # 1A)				Future Conditions (Scenario # 1B)				Future Conditions (Scenario # 1C)			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	EB	5.1	A	0.0	A	5.1	A	0.0	A	5.1	A	0.0	A
		WB	5.4	A	4.7	A	5.4	A	4.7	A	5.4	A	4.7	A
		NB	6.4	A	6.4	A	6.5	A	6.5	A	6.5	A	6.5	A
		SB	14.0	B	5.0	A	14.6	B	5.1	A	14.6	B	5.1	A
2 Nixon Road & W. Site Drive	Stop (Minor)	WB	817.1	F	439.9	F	841.8	F	454.4	F	138.1	F	220.9	F
		NB	Free		Free		Free		Free		Free		Free	
		SB	Free		Free		Free		Free		Free		Free	
3 Nixon Road & Traver Boulevard	Stop (Minor)	EB	5.9	A	4.5	A	6.0	A	4.6	A	6.0	A	4.6	A
		NB	9.5	A	8.9	A	9.9	A	9.1	A	6.8	A	6.2	A
		SB	14.4	B	5.6	A	14.9	B	5.6	A	15.0	B	5.6	A
4 Nixon Road & Argonne Drive	Stop (Minor)	WB	23.9	C	21.1	C	23.9	C	21.1	C	23.9	C	21.1	C
		NB	Free		Free		Free		Free		Free		Free	
		SBL	8.7	A	9.4	A	8.7	A	9.4	A	8.7	A	9.4	A

The results of the future conditions vehicle analysis for **Scenario # 2 (A-C)** are included in **Appendix D** and summarized in **Table 9**. The results for **Scenario # 2 (A)** are based on future volumes shown in **Figure 8C**, and the results for **Scenario # 2 (B-C)** are based on future volumes shown in **Figure 8D**. These results indicates that all approaches and movements at the study intersections in all scenarios are expected to continue operating acceptably in a manner similar to the background conditions vehicle analysis during both peak periods, with minimal increases in delays, with the following exceptions:

Scenario # 2A

- Nixon Road & W. Site Drive: The westbound approach is expected to operate at LOS F with significant increases in delays during both peak hours as compared to background conditions analysis. However, in comparison to future conditions Scenario # 1A analysis, a decrease in delays of approximately 102-seconds during School AM peak hour and approximately 143-seconds during School PM peak hour is observed.

Review of SimTraffic microsimulation indicates prolonged vehicle queues on the westbound approach, lasting for approximately 15-minutes during School AM peak hour and most of School PM peak hour. Vehicles were frequently observed waiting for a substantial amount of time to find a suitable gap within the flow of through traffic on northbound Nixon Road.

Scenario # 2B

- Nixon Road & W. Site Drive: The westbound approach is expected to continue operating at LOS F similar to Scenario # 2A operations during both peak periods, with minimal increases in delays due to addition of King ES staging trips.

Review of SimTraffic microsimulation indicates similar vehicular operation as observed during Scenario # 2A with minimal increases in vehicle queuing.

Scenario # 2C

- Nixon Road & W. Site Drive: The westbound approach is expected to continue operating at LOS F during peak periods as observed in previous scenarios. However, significant decreases in delays are expected during both peak periods, with the addition of the evaluated improvements on Nixon Road.

Review of SimTraffic network simulations indicates prolonged vehicle queues on the westbound approach, lasting for approximately 9-minutes during School AM peak hour, and approximately 15-minutes during School PM peak hour.

Table 9: Future Intersection Vehicle Operations Scenario # 2 (A-C)

Intersection	Control	Approach	Future Conditions (Scenario # 2A)				Future Conditions (Scenario # 2B)				Future Conditions (Scenario # 2C)			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	EB	5.0	A	0.0	A	5.1	A	0.0	A	5.1	A	0.0	A
		WB	5.8	A	5.0	A	5.9	A	5.0	A	5.9	A	5.0	A
		NB	6.3	A	6.2	A	6.4	A	6.3	A	6.4	A	6.3	A
		SB	12.9	B	4.8	A	13.4	B	4.9	A	13.4	B	4.9	A
2 Nixon Road & W. Site Drive	Stop (Minor)	WB	714.4	F	296.7	F	737.6	F	308.8	F	97.7	F	122.1	F
		NB	Free				Free				Free			
		SB	Free				Free				Free			
3 Nixon Road & Traver Boulevard	Stop (Minor)	EB	5.7	A	4.4	A	5.8	A	4.4	A	5.8	A	4.4	A
		NB	8.1	A	8.0	A	8.4	A	8.2	A	6.1	A	5.6	A
		SB	12.7	B	5.4	A	13.1	B	5.4	A	14.8	B	5.4	A
4 Nixon Road & Argonne Drive	Stop (Minor)	WB	23.9	C	21.1	C	23.9	C	21.1	C	23.9	C	21.1	C
		NB	Free				Free				Free			
		SBL	8.7	A	9.4	A	8.7	A	9.4	A	8.7	A	9.4	A

Intersection	Control	Approach	Future Conditions (Scenario # 2A)				Future Conditions (Scenario # 2B)				Future Conditions (Scenario # 2C)			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
5 Bluett Drive & S. Site Drive	Stop (Minor)	EB	Free				Free				Free			
		WB	Free				Free				Free			
		SB	10.3	B	9.8	A	10.3	B	9.8	A	10.3	B	9.8	A

The results of the future conditions vehicle analysis for **Scenario # 3 (A-B)** are included in **Appendix D** and summarized in **Table 10**. The results for **Scenario # 3 (A)** are based on future volumes shown in **Figure 8E**, and the results for **Scenario # 3 (B)** are based on future volumes shown in **Figure 8F**. These results indicates that all approaches and movements at the study intersections in all scenarios are expected to continue operating acceptably in a manner similar to the background conditions vehicle analysis during both peak periods, with minimal increases in delays, with the following exceptions:

Scenario # 3A

- Nixon Road & W. Site Drive: The westbound approach is expected to operate at LOS E during School AM peak hour, and at LOS F during School PM peak hour. However, in comparison to future conditions Scenario # 1A analysis, a significant decrease in delays of approximately 780-seconds during School AM peak hour and approximately 364-seconds during School PM peak hour is observed, due to separation of Logan ES and Clague MS PUDO operations.

Review of SimTraffic network simulation indicates acceptable operations during School AM peak hour. However, prolonged vehicle queues for approximately 24-minutes were observed on the westbound approach.

Scenario # 3B

- Nixon Road & W. Site Drive: The westbound approach is expected to operate at LOS E during School AM peak hour, and at LOS F during School PM peak hour. However, in comparison to future conditions Scenario # 1A analysis, a significant decrease in delays of approximately 746-seconds during School AM peak hour and approximately 414-seconds during School PM peak hour is observed, due to separation of Logan ES and Clague MS PUDO operations.

Review of SimTraffic network simulation indicates acceptable operations during School AM peak hour. However, prolonged vehicle queues for approximately 18-minutes were observed on the westbound approach.

Table 10: Future Intersection Vehicle Operations Scenario # 3 (A-B)

Intersection	Control	Approach	Future Conditions (Scenario # 1A)				Future Conditions (Scenario # 3A)				Future Conditions (Scenario # 3B)			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	EB	5.1	A	0.0	A	4.6	A	0.0	A	1.9	A	0.0	A
		WB	5.4	A	4.7	A	4.3	A	4.3	A	4.2	A	4.0	A
		NB	6.4	A	6.4	A	4.7	A	5.8	A	4.6	A	5.1	A
		SB	14.0	B	5.0	A	8.7	A	4.6	A	6.4	A	4.3	A
2 Nixon Road & W. Site Drive	Stop (Minor)	WB	817.1	F	439.9	F	36.3	E	75.6	F	70.8	F	25.2	D
		NB	Free				Free				Free			
		SB	Free				Free				Free			

	Intersection	Control	Approach	Future Conditions (Scenario # 1A)				Future Conditions (Scenario # 3A)				Future Conditions (Scenario # 3B)			
				School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
3	Nixon Road & Traver Boulevard	Stop (Minor)	EB	5.9	A	4.5	A	5.7	A	4.5	A	4.7	A	3.9	A
			NB	9.5	A	8.9	A	5.3	A	7.1	A	5.2	A	3.4	A
			SB	14.4	B	5.6	A	8.3	A	5.1	A	6.4	A	4.7	A
4	Nixon Road & Argonne Drive	Stop (Minor)	WB	23.9	C	21.1	C	16.5	C	20.0	C	19.7	C	18.1	C
			NB	Free				Free				Free			
			SBL	8.7	A	9.4	A	8.2	A	9.2	A	8.4	A	8.8	A

Summary

- The result of the evaluation indicates that all approaches and movements at study intersections, in all scenarios, are expected to continue operating acceptably in a manner similar to the background conditions analysis with minimal increases in delays, during both peak hours. This excludes the intersection of Nixon Road & W. Site Drive, which is expected operate at LOS E or worse, during all scenarios. However, the results indicates that separating the Logan ES and Clague MS PUDO operations by approximately 15-20 minutes would result in the least amount of delays and vehicles queuing at the egressing traffic at W. Site Drive, during studied School AM and School PM peak hours.

B. Pedestrian Analysis

The results of the future conditions pedestrian analysis at the uncontrolled crossings at the studied unsignalized intersections *with the proposed development* are included in **Appendix D** and summarized in **Table 11**. These results indicate that all evaluated uncontrolled crossings at the study intersections are expected to continue operating acceptably in a manner similar to the background condition pedestrian analysis with minimal increases in P_D during the studied School AM and School PM peak hours, with the following exceptions:

Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at northbound and southbound approaches are expected to operate at LOS E & F, respectively, during both peak hours.

Table 11: Future Unsignalized Intersection Pedestrian Operations

	Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
				School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
				P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS
1	Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	NB	0.467	E	0.422	E	0.476	E	0.433	E	0.009	-	0.011	-
			SB	0.406	E	0.360	E	0.621	F	0.563	F	0.215	E→F	0.203	E→F
			EB	0.133	B	0.126	B	0.133	B	0.126	B	0.000	-	0.000	-
			WB	0.248	C	0.227	C	0.240	C	0.203	C	-0.008	-	-0.024	-
2	Nixon Road & W. Site Drive	Stop (Minor)	NB	N/A				N/A				N/A			
			SB	N/A				N/A				N/A			
3	Nixon Road & Traver Boulevard	Stop (Minor)	NB	0.588	F	0.550	F	0.627	F	0.590	F	0.039	-	0.040	-
			SB	0.558	F	0.522	F	0.564	F	0.528	F	0.006	-	0.006	-
			EB	0.243	C	0.229	C	0.239	C	0.219	C	-0.004	-	-0.010	-

Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS
4 Nixon Road & Argonne Drive	Stop (Minor)	NB	0.000*	A	0.000*	A	0.000*	A	0.000*	A	0.000*	-	0.000*	-
		SB	0.000*	A	0.000*	A	0.000*	A	0.000*	A	0.000*	-	0.000*	-

* Indicates one (1) or no pedestrian volume present. Note: P_D = Proportion of pedestrians giving a "dissatisfied" rating or worse.

5.3 SAFETY REVIEW

5.3.1 Crash Analysis

A crash analysis was conducted for all of the existing study intersections. F&V obtained historical crash data for the most recent available five years (January 1, 2018, to December 31, 2022) from Michigan Traffic Crash Facts (MTCF). The crashes at each of the intersections are summarized by type in **Table 12**.

The results of the analysis indicates that a total of 5 crashes were reported at or associated with the study intersections. The majority of the crashes were angle (4), mostly occurring at the intersection of Nixon Road & Argonne Drive. Angle crashes are typical at intersections due to vehicles' path intersecting at oblique angles, making it difficult for drivers to accurately judge the trajectory of other vehicles. Review of the detailed crash reports (UD-10s) for the angle crashes indicates that no significant pattern of crashes was present. Additionally, there were no crashes reported with fatalities or any type of injuries.

Table 12: Study Intersections Crash Summary

Intersection	Crash Type									Total
	Single Motor Vehicle Crash	Head-On	Head-On Left-Turn	Angle	Rear End	Sideswipe-Same	Sideswipe-Opposite	Other / Unknown		
1 Nixon Road & Meade Court/Bluet Road	0	0	0	1	0	0	0	0	0	1
2 Nixon Road & Clague Street	0	0	0	0	0	0	0	0	0	0
3 Nixon Road & Traver Boulevard	0	0	0	1	1	0	0	0	0	2
4 Nixon Road & Argonne Drive	0	0	0	2	0	0	0	0	0	2
TOTAL	0	0	0	4	1	0	0	0	0	5

5.3.2 Highway Safety Manual (HSM) Analysis

A safety review was performed for the study intersections according to the Highway Safety Manual (HSM) crash predictive methodology. The analysis included the evaluation of the existing operations of the study intersections and a safety review of alternative options for the study intersections.

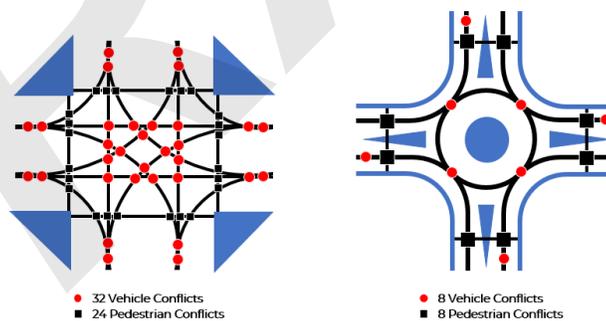
The HSM predictive methods analysis spreadsheet, provided by the MDOT Safety Programs Unit, was used to determine the expected and predicted crashes, associated with the existing and the alternative option of converting existing study intersections to roundabout intersections. This analysis used the crash prediction values provided by MDOT in the HSM spreadsheet and the Urban & Suburban Intersection model was used for this analysis. The results of the analysis are summarized in **Table 9** below and the detail HSM summary sheets are provided in the **Appendix D**.

Intersection	Scenario	Roadway Geometry	Predicted Crashes per Year				Expected Crashes per Year	
			Total	Reduction (Total)	Fatal & Injury	Reduction (F&I)	Total	Reduction (Total)
1 Nixon Road & Meade Court/Bluett Drive	Existing	4-Leg Stop Control	0.84	--	0.17	--	0.66	--
	Proposed	Roundabout	0.47	-44.0%	0.1	-41.2%	0.41	-37.9%
2 Nixon Road & Clague Street	Existing	3-Leg Stop Control	0.52	--	0.12	--	0.38	--
	Proposed	Roundabout	0.29	-44.2%	0.06	-50.0%	0.24	-36.8%
3 Nixon Road & Traver Boulevard	Existing	3-Leg Stop Control	0.46	--	0.1	--	0.38	--
	Proposed	Roundabout	0.25	-45.7%	0.06	-40.0%	0.23	-39.5%
4 Nixon Road & Argonne Drive	Existing	3-Leg Stop Control	0.23	--	0.04	--	0.2	--
	Proposed	Roundabout	0.13	-43.5%	0.02	-50.0%	0.12	-40.0%

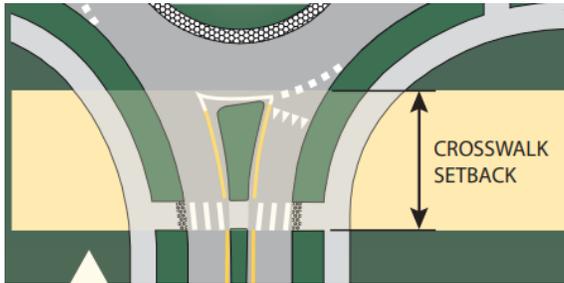
The results of the analysis indicates that lower than one (1) crash per year is predicted at all of the study intersection based on the existing geometry of intersections. With the construction of roundabout, the total crashes are predicted to decrease by approximately 45% at all of the study intersections.

Federal Highway Administration (FHWA) identifies roundabouts as a proven safety countermeasure because of their ability to substantially reduce the types of crashes that result in injury or loss of life.

- Conflict Points** – Roundabouts typically have lower conflict points. A single lane roundabout has more than 50% fewer pedestrian-vehicle conflict points than a comparable stop or signal control intersection. These reduced conflict points significantly reduce the risk of crashes involving young pedestrians, while also effectively minimizing conflicts between bicycles and vehicles.



- Speed Control & Setback Crossing**– Roundabouts have crosswalks set back from the road, which means pedestrians only need to cross one direction of traffic at a time because the traffic entering and exiting is separated. They also usually have yield signs at the entry points, encouraging drivers to pay attention to pedestrians at the crosswalks without worrying about entering, circulating, or exiting traffic. Additionally, the traffic speed in roundabouts is typically more suitable for comfortable bicycle riding.



Additional Pedestrian Treatments at Roundabouts:

- Striping & Signage** – Providing crosswalk striping and accompanying signs in such a manner as to maximize their visibility to drivers. Additionally, advanced warning signs can be placed to alert drivers that they are approaching a roundabout and encourage speed reduction.



- Rectangular Rapid Flash Beacons (RRFBs):** RRFBs are highly effective in grabbing drivers' attention. They consist of rapidly flashing LED lights and are activated by pedestrians. When used, they significantly increase the likelihood of drivers yielding to pedestrians, making them a valuable tool in areas with heavy pedestrian traffic.



- **Embedded Pavement Lights:** These lights are installed directly in the pavement at crosswalks. They provide a clear visual indicator to drivers about the presence of pedestrians. The embedded lights are especially effective in low-light conditions or when weather conditions may reduce visibility.



- **Pedestrian Hybrid Beacons ("HAWK" Signals):** This advanced system offers a higher level of control at crosswalks. It provides pedestrians with a signal to activate, bringing traffic to a complete stop to allow for safe pedestrian crossings. "HAWK" signals are highly effective in areas with heavy pedestrian traffic, ensuring a controlled and safe crossing experience.



5.3.3 City of Ann Arbor Comprehensive Transportation Plan

The City's comprehensive transportation plan, Ann Arbor Moving Together Toward Vision Zero, A2Zero (carbon neutrality plan), the Treeline master plan, and the City's Capital Improvement Plan (CIP) 2024-2029 were reviewed for additional planned multi-modal infrastructure that would have potential impacts on the study transportation network.

Tier 3 Focus Corridors

The 'Tier 3 Focus Corridors' are 20 miles of specific transportation corridors in the City of Ann Arbor that have been identified as high-priority corridors with a focus on safety and multi-modal needs. The plan outlines various strategies and projects to improve these corridors, such as enhancing public transit, improving pedestrian and cyclist safety, managing traffic flow, and optimizing road infrastructure. The following are the 'Tier 3 Focus Corridors' in the study roadway network:

- Nixon Road (Dhu Varren Road/Green Road to Huron Parkway)

Minor All Ages and Abilities Bike Routes

The following are the proposed ‘Minor All Ages and Abilities’ bikes routes in the study roadway network which will eventually incorporate striped/painted bike lanes, buffered bike lanes, and/or contra-flow bike lanes, with all upgrades to be accomplished by 2035.

- Nixon Road (US-23 to Plymouth Road)

Local All Ages and Abilities Bike Routes

The following are the proposed ‘Local All Ages and Abilities’ bikes routes in the study roadway network which will eventually incorporate striped/painted bike lanes, buffered bike lanes, and/or contra-flow bike lanes, with all upgrades to be accomplished by 2035.

- Bluett Drive (Nixon Road to Georgetown Boulevard)

5.3.4 Speed Limit Review on Nixon Road

The *Michigan Legislature Section 257.627a* was reviewed in order to assess the feasibility of implementing a school zone speed limit on a *Major Collector* roadway, such as Nixon Road, with a posted speed limit of 30 mph. However, the existing guidelines do not provide explicit criteria for such a roadway classification with a 30 mph speed limit. Therefore, it is recommended to submit a formal request to the City of Ann Arbor to see if the local authorities permit establishing a school zone speed limit on this section of roadway.

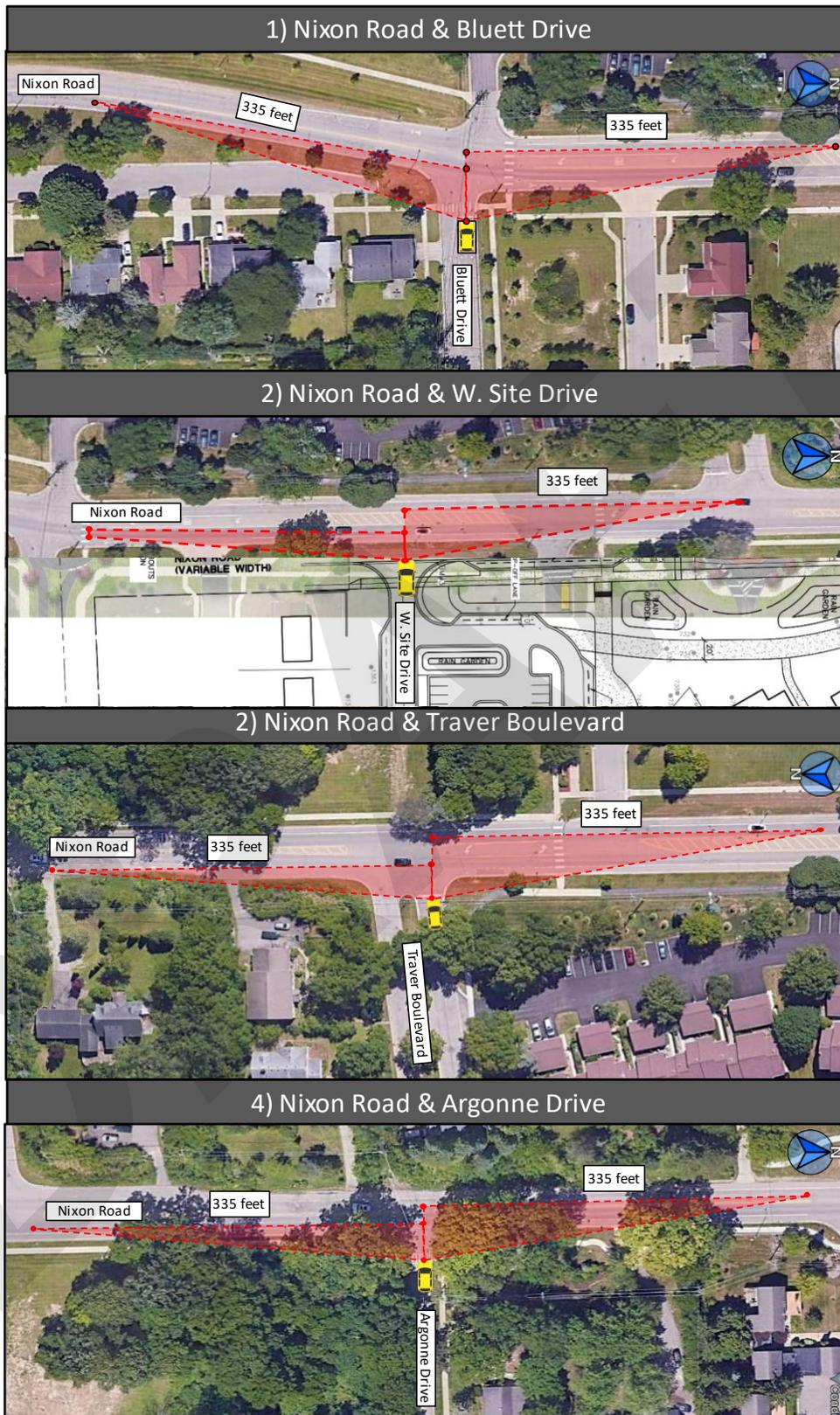
5.3.5 Intersection Sight Distance Evaluation

An intersection sight distance evaluation was performed to determine if there is adequate sight distance for the existing study intersections, considering pedestrian and bicycle conflicts based on the requirements outlined in the *American Association of State Highway and Transportation Officials (AASHTO), 2011, Geometric Design of Highways and Streets*. According to *Section 9.5 – Intersection Sight Distance*, an intersection sight distance of 335 feet is required for a left-turn from a complete stop and a sight distance of 290 feet is required for a right-turn from a stopped position at the study minor roadways along Nixon Road, based on the existing 30 mph speed limit along Nixon Road.

Additionally, the AASHTO manual states that the “vertex (decision point) of the departure sight triangle on the minor road should be 18-ft from the edge of the major-road traveled way”. This gives an accurate depiction of driver behavior when preparing to make a turn from a minor roadway.

The results of the sight distance analysis indicates that a driver waiting to egress the study minor roadways onto Nixon Road will not experience any visual obstruction and create conflict with pedestrians and bicycle traffic provided the areas shown in **Exhibit 1** below are free of vegetation and parked cars, and a clear line of sight is provided.

EXHIBIT 1: INTERSECTION SIGHT DISTANCE



6 IMPROVEMENT ANALYSIS

6.1 CAPACITY AND QUALITY/LEVEL OF SERVICE ANALYSIS

6.1.1 Pedestrian Analysis

The results of the analysis showed that mitigation measures should be considered at the following intersections to improve the pedestrian operations.

- Nixon Road & Meade Court/Bluett Drive
- Nixon Road & Traver Boulevard

The following methodologies were reviewed to evaluate improvements at these intersections.

A. Ann Arbor's Crosswalk Design Guidelines

Ann Arbor's Crosswalk Design Guidelines were evaluated based on *NCHRP-562 Worksheet* to determine what improvements, if any, are recommended for the failing uncontrolled crossings at the studied roadways. The worksheet requires site specific input for uncontrolled crossing location, major road volumes, peak-hour pedestrian volumes at uncontrolled crossing, speed limit on major street, and pedestrian crossing distance. This information is used to generate a graph to determine if the uncontrolled crossing needs a *Standard*, *Standard+*, or a *High-Risk Location* treatment based on classification of the streets.

In this study, the uncontrolled crossings at the studied roadways were evaluated based on the posted speed limits along the studied sections of roadway, the proposed lane use and traffic control shown in **Figure 4**, the future major approach volumes shown in **Figure 8A**, and the future pedestrian volumes shown in **Figure 8G**. The results of the evaluation are summarized in **Table 13** below.

Table 13: Ann Arbor Guidelines Recommended Treatments

Intersection		Street (Type)	Approach	Crossing Category	Planned Treatments	Additional Recommended Treatments
1	Nixon Road & Meade Court/Bluett Drive	Nixon Road (Major Collector)	NB & SB	Standard+	High Visibility Crosswalk Markings	<ul style="list-style-type: none"> • Pedestrian Warning Series (W11-2) or School Warning Series (S1-1)
3	Nixon Road & Traver Boulevard	Nixon Road (Major Collector)	NB & SB	High Risk Location	High Visibility Crosswalk Markings	<ul style="list-style-type: none"> • Bright Sides • In-Lane Signs (R1-6) • Pedestrian Islands • R1-6a Signs on Island • Bump Outs • Stop Here for Ped. (R1-5b) Signs w/ Stop Bar on Multilane Approach

B. HCM7 Pedestrian Analysis

The *HCM 7th Edition* and *USDOT Federal Highway Administration (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing* were evaluated to provide supplemental countermeasures that can be implemented at the failing uncontrolled crossings at the studied intersections and midblock locations to increase motorist yielding rates, as provided in **Appendix A**. Implementing these countermeasures can improve pedestrian traffic progression and safety at the uncontrolled crossings, and these treatments are included in the HCS 2023 TWSC module. Therefore, the potential treatments for the failing uncontrolled crossings at the studied roadways were identified based on the *USDOT FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing (Table 1)* and evaluated in HCS 2023 software.

In this study, the uncontrolled crossings at the studied roadways were evaluated based on the posted speed limits along the studied sections of roadway, the proposed lane use and traffic control shown in **Figure 4**, the future major approach volumes shown in **Figure 8A**, and the future pedestrian volumes shown in **Figure 8G**. Additionally, it is assumed that the future peak hour volume represents 8-12% of the daily traffic volume across all studied sections of the roadways within the study network, leading to an estimated average daily

traffic (ADT) of fewer than 15,000 vehicles for the entire network. The results of the evaluation are summarized in **Table 14**.

Table 14: HCM 7 Potential Recommended Treatments

Intersection	Approach	Potential Candidate Treatments					
		High-visibility Crosswalk markings with crossing warning signs (W11-2, W16-7P)	In-Street Pedestrian Crossing sign (R1-6a)	Curb Extension	Pedestrian refuge island	RRFB	PHB
1 Nixon Road & Meade Court/Bluett Drive	NB & SB	Recommended	Optional	Optional	Optional	Optional	Optional
3 Nixon Road & Traver Boulevard	NB & SB	Recommended	Optional	Optional	Optional	Optional	Optional

C. Summary

The review of City of Ann Arbor's Crosswalk Design Guidelines, USDOT Federal Highway Administration (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossings, and HCM 7th Edition identified potential pedestrian treatments. These treatments were evaluated in the HCS TWSC module based on their average motorist yielding rates provided in HCM 7th Edition. The results of evaluation provides the following recommended improvements which are further illustrated in **Figure 9B**:

Table 15: Recommended Pedestrian Treatments

Intersection	Approach	Recommended Treatments
1 Nixon Road & Meade Court/Bluett Drive	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).
3 Nixon Road & Traver Boulevard	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).

The results of the future conditions pedestrian analysis at the unsignalized intersection uncontrolled crossings **with the proposed improvements** are included in **Appendix D** and summarized in **Table 16**. These results indicates that with the implementation of the proposed improvements all evaluated failing uncontrolled crossings at the study intersections are expected to operate at LOS D or better with significant improvement in pedestrian dissatisfaction ratings, during both studied peak periods.

Table 16: Future Unsignalized Intersection Pedestrian Operations with Improvements

Intersection	Control	Approach	Future Conditions				Future Conditions w/IMP				Difference			
			School AM Peak		School PM Peak		School AM Peak		School PM Peak		School AM Peak		School PM Peak	
			P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS	P _D	LOS
1 Nixon Road & Meade Court/Bluett Drive	Stop (Minor)	NB	0.476	E	0.433	E	0.322	D	0.307	D	-0.154	E→D	-0.126	E→D
		SB	0.621	F	0.563	F	0.312	D	0.271	D	-0.309	F→D	-0.292	F→D
		EB	0.133	B	0.126	B	0.133	B	0.126	B	0.000	-	0.000	-
		WB	0.240	C	0.203	C	0.240	C	0.203	C	0.000	-	0.000	-
3 Nixon Road & Traver Boulevard	Stop (Minor)	NB	0.627	F	0.590	F	0.317	D	0.289	D	-0.310	F→D	-0.301	F→D
		SB	0.564	F	0.528	F	0.266	D	0.246	C	-0.298	F→D	-0.282	F→C
		EB	0.239	C	0.219	C	0.239	C	0.219	C	0.000	-	0.000	-

7 PICK-UP/DROP-OFF (PUDO) OPERATIONS

7.1 PUDO QUEUE LENGTH

The proposed development plans to increase existing enrollment at Logan ES from 362 students to 600 students. The number of weekday School AM and School PM peak hour multi-modal trips that would be generated by the proposed development were forecasted based on the existing peak hour traffic volumes collected at the school site with adjustments made to account for the increase in student enrollment, and are provided in **Table 3**. Based on the review of the personal vehicles trip generation summary, it is anticipated that approximately 209 students will be dropped-off in the School AM peak hour and approximately 134 students will be picked up in the School PM peak hour.

Data collected by F&V staff for previous schools performed by F&V indicates that approximately 80% of AM peak hour traffic typically arrives in a peak 20-minute period and approximately 70% of PM peak hour traffic typically arrives in a peak 30-minute period. Additionally, data collected for previous schools performed by F&V indicates an average drop-off rate of 45 seconds per vehicle and a pick-up rate of 5.5 minutes per vehicle. This information was used to calculate the necessary queue length to accommodate the number of PUDO vehicles associated with the Logan ES. Additionally, a Poisson distribution analysis was performed to determine the queuing associated with random arrivals and added into the projected queue length to accommodate the total number of PUDO vehicles.

The results of the evaluation indicates that, at least 375-feet and 875-feet of vehicle stacking space needs to be provided for the AM drop-off and the PM pick-up operations, respectively.

Table 17: Logan ES PUDO Queue Length Summary

SCHOOL STACKING SPACE CALCULATOR	Drop-Off	Pick-Up
Number of PUDO	209	134
Peak Period Time (minutes)	20	30
% PUDO during peak period	80%	70%
Time per Vehicle (s)	45	330
Vehicle Stacking Length (ft.)	25	25
Number of Projected PUDO Vehicles	7	18
Projected PUDO Queue Length (ft.)	175	450
Number of Random Arriving Vehicles	8	17
Random Arriving Vehicle Queue Length (ft.)	200	425
Total Number of Vehicles	15	35
Total Queue Length (ft.)	375	875

7.2 PLANNED PUDO OPERATIONS

The proposed site plan provides approximately 415-feet of loading space at the Logan ES Entrance Door with additional combined 638-feet vehicle stacking space to the south of the Logan ES parking area and to the east of the proposed Soccer Field. Therefore, the proposed development plan provides adequate space for passenger vehicle PUDO operations, without obstructing traffic flow within the site, and the PUDO vehicular queues are not expected to backup and create conflict with City streets.

Additionally, the proposed development plans to provide a dedicated bus storage lane at northbound Nixon Road, south of Traver Boulevard to accommodate Logan ES bus PUDO operations. The planned passenger vehicle and bus PUDO operations are further illustrated in **Figure 9A**.

7.2.1 Clague MS PUDO Queue Length

The proposed Logan ES will share the proposed access on Nixon Road with the existing Clague MS. An overlap of 15-20 minutes exists between the planned PUDO operations of Logan ES and Clague MS. This could potentially result in concurrent passenger vehicle PUDO operations for both schools. Therefore, the projected queue length for the number of PUDO vehicles associated with Clague MS was calculated to determine the storage space needed to accommodate Clague MS PUDO operations. This queue length determination was based on the future peak hour passenger vehicle traffic volumes associated with the Clague MS, as provided in **Table 2**. Additionally, a poisson distribution analysis was performed to determine the queuing associated with random arrivals and added into the projected queue length to accommodate the total number of PUDO vehicles.

The results of the evaluation indicates that, at least 425-feet and 575-feet of vehicle stacking space needs to be provided for the AM drop-off and the PM pick-up operations, respectively.

Table 18: Clague MS PUDO Queue Length Summary

SCHOOL STACKING SPACE CALCULATOR	Drop-Off	Pick-Up
Number of PUDO	240	85
Peak Period Time (minutes)	20	30
% PUDO during peak period	80%	70%
Time per Vehicle (s)	45	330
Vehicle Stacking Length (ft.)	25	25
Number of Projected PUDO Vehicles	8	11
Projected PUDO Queue Length (ft.)	200	275
Number of Random Arriving Vehicles	9	12
Random Arriving Vehicle Queue Length (ft.)	225	300
Total Number of Vehicles	17	23
Total Queue Length (ft.)	425	575

Planned PUDO Operations

The proposed site plan provides approximately 425-feet of loading space at the Clague MS Entry Door with additional combined 778-feet loading space to the south of the Logan ES parking area, to the east of the proposed Soccer Field, and to the south of Clague MS Entry Door. Therefore, the proposed development plan provides adequate space for passenger vehicle PUDO operations, without obstructing traffic flow within site, and the PUDO vehicular queues are not expected to backup and create conflict with City streets.

Additionally, the proposed development plans to provide a dedicated bus storage lane at westbound Bluett Drive, east of the existing vehicular access on Bluett Drive to accommodate Clague MS bus PUDO operations. The planned passenger vehicle and bus PUDO operations are further illustrated in **Figure 9A**.

7.3 PUDO OPERATIONS SUMMARY

In order to accommodate the pick-up and drop-off operations for both Logan ES and Clague MS, approximately 875-feet and 575-feet of on-site loading space needs to be provided, respectively. The proposed site plan provides a 415-feet loading space at Logan ES Entrance Door, and a 425-feet loading space at Clague MS Entrance Door. Moreover, to accommodate the potential for excessive vehicle queuing at both schools, a combined 778-feet vehicle stacking space is provided within the school site.

Therefore, the proposed development plan provides adequate space for passenger vehicle PUDO operations for both Logan ES and Clague MS, based on the projected student population without obstructing traffic flow within the site, and vehicle queues are not expected impact operations on Nixon Road. However, if school operations are modified or if passenger vehicle PUDO travel patterns change in

future, the following recommendations are provided for consideration to mitigate any potential future concerns:

- Consider staggering the start-time/end-time for different grade levels at both schools.
 - This approach seeks to mitigate the impact of the proposed development on the study roadway network and prevent potential conflicts in PUDO operations between the two schools. By dispersing student arrivals and departures over different times and a more extended period, it can help optimize traffic management and alleviate congestion concerns.

7.4 GENERAL PUDO CONSIDERATIONS

- The PUDO operations will be under the supervision of staff members who will guide students accordingly through both the buses and vehicle staging areas.
- The staff involved in the PUDO operations shall have appropriate PPE, including high visibility safety vests, and other safety measures as appropriate during hours of darkness. All staff and employees performing this type of operations should be trained and in compliance with all MIOSHA safety requirements.
- The staff members should be instructed to parking in designated areas and not within the PUDO or the bus lane.
- Both the bus lane and the PUDO lane should be restricted with “No Parking” on school days between 7AM – 4PM.
- The traffic operations plans should be communicated to the passenger vehicles and staff members. If any adjustments to the traffic operations plan are anticipated, clear communication with both passenger vehicles and staff members will take place in advance to minimize confusion and ensure a coordinated effort.

8 KEY FINDINGS

8.1 EXISTING CONDITIONS

Vehicle Analysis

The results of the existing (2023) conditions vehicle analysis indicates that all of the study intersections approaches and movements are currently operating acceptably, at LOS D or better, during both School AM and School PM peak hours, with the following exceptions:

- Nixon Road & Meade Court/ Bluett Drive
- Nixon Road & W. Site Drive
- Nixon Road & Traver Boulevard

Pedestrian Analysis

The results of the existing (2023) conditions pedestrian analysis indicates that all uncontrolled crossings at study intersections are currently operating acceptably, at LOS D or better, with the exception of the SB approach at the following intersections:

- Nixon Road & Meade Court/Bluett Drive
- Nixon Road & W. Site Drive

8.2 BACKGROUND CONDITIONS

A conservative annual growth rate of **0.916%** per year was provided by WATS for use in this analysis to project the existing 2023 traffic volumes to the buildout year of 2027. Additionally, the background conditions analysis was conducted based on the City of Ann Arbor’s planned improvements along Nixon Road.

Vehicle Analysis

The results of the background conditions vehicle analysis ***without the proposed development*** indicates that all approaches and movements at the study intersections are expected to operate acceptably at LOS D or better, with the following exceptions:

- Nixon Road & W. Site Drive: The WB approach is expected to operate at LOS F during School AM peak hour. However, review of SimTraffic microsimulations indicates acceptable operations with a 95th percentile queue length of approximately 130-ft (~5 vehicles) which is not significant.

Pedestrian Analysis

The results of the background conditions pedestrian analysis ***without the proposed development*** indicates that all evaluated uncontrolled crossings at the study intersections are expected to operate acceptably at LOS D or better, with the following exceptions:

- Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS E during both peak hours.
- Nixon Road & Traver Boulevard: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS F during both peak hours.

8.3 FUTURE CONDITIONS

Vehicle Analysis

- The future conditions vehicle analysis ***with the proposed development*** involved evaluating various scenarios to determine the most effective approach for future school operations. These scenarios included providing right-in/right-out (RIRO) only access via Nixon Road, additional exit-only access on Bluett Drive, addition of King ES staging trips, improvements on Nixon Road, and combining and separating Logan ES and Clague MS PUDO operations.
- The result of the evaluation indicates that all approaches and movements at study intersections, in all scenarios, are expected to continue operating acceptably in a manner similar to the background conditions analysis with minimal increases in delays, during both peak hours.
- This excludes the intersection of Nixon Road & W. Site Drive, which is expected operate at LOS E or worse, during all scenarios. However, the results indicates that separating the Logan ES and Clague MS PUDO operations by approximately 15-20 minutes would result in the least amount of delays and vehicles queuing at the egressing traffic at W. Site Drive, during both peak hours.

Pedestrian Analysis

- The results of the future conditions pedestrian analysis ***with the proposed development*** indicates that all evaluated uncontrolled crossings at the study intersections are expected to continue operating acceptably in a manner similar to the background condition pedestrian analysis with minimal increases in P_D during the studied School AM and School PM peak hours, with the following exceptions:
 - Nixon Road & Meade Court/Bluett Drive: The uncontrolled crossings at NB and SB approaches are expected to operate at LOS E & F, respectively, during both peak hours.

8.4 SAFETY REVIEW

- A crash analysis was conducted for all of existing study intersections for the most recent available five years crash data. The results of the analysis indicates that a total of 5 crashes were reported at or associated with the study intersections. Review of the detailed crash reports (UD-10s) indicates that no significant pattern of crashes was present. Additionally, there were no crashes reported with fatalities or any crashes with injuries.
- A safety review was performed for the study intersections according to the *Highway Safety Manual* (HSM) crash predictive methodology. With the construction of roundabout, the total crashes are predicted to decrease by approximately 45%.
- The City's comprehensive transportation plan, '*Ann Arbor Moving Together Toward Vision Zero*' was reviewed for additional planned multi-modal infrastructure that would have potential impacts on the

study transportation network. The plan includes *Tier 3 Focus Corridor*, and *Minor & Local All Ages and Abilities (AAA) Bike Routes* in the study network which have been highlighted in the study.

- The review of Michigan Legislature Section 257.627a indicates A school zone speed limit may be decreased by not more than 20 miles per hour less than the speed limit normally posted but shall be not less than 25 miles per hour.
- The sight distance analysis performed at the study intersections indicates that adequate sight distance is provided, assuming the vision triangles highlighted in the study remain free of vegetation and parked vehicles.

8.5 SITE CIRCULATION REVIEW

- The passenger vehicle PUDO queue lengths associated with Logan ES & Clague MS were calculated based on future student enrollment at both schools. The results of the evaluation indicates that, at least 875-feet (35 vehicles) and 575-feet (23 vehicles) of vehicle stacking space are needed to accommodate PUDO operations for Logan ES & Clague MS, respectively.
- The site plan has been designed to accommodate the projected vehicle queuing on site and is not expected to impact the operations on Nixon Road. The site circulation plan for both schools is shown in the attached **Figure 9A**.

8.6 IMPROVEMENT ANALYSIS

Pedestrian Analysis

- The review of the City of Ann Arbor's Crosswalk Design Guidelines, HCM 7th Edition and *USDOT Federal Highway Administration (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing* provides various improvements at the failing uncontrolled crossings which have been evaluated in *HCS 2023 TWSC Module* as highlighted below in the recommendations.
- The results of the future conditions pedestrian analysis **with the proposed improvements**, indicates that with the implementation of the proposed improvements all evaluated failing uncontrolled crossings at the study intersections are expected to operate at LOS D or better with significant improvement in pedestrian dissatisfaction ratings, during both peak periods.

9 RECOMMENDATIONS

The following mitigation measures are recommended for the proposed development plan. These recommendations are further illustrated in **Figure 9B**.

Table 19: Logan ES Recommended Improvements

	Intersection	Approach	Recommended Improvements
1	Nixon Road & Meade Court/Bluett Drive	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).
3	Nixon Road & Traver Boulevard	NB & SB	High-visibility crosswalk markings with stop line. Pedestrian Hybrid Beacon (PHB) and school crossing signs (S1-1 with W16-7P).

10 CONCLUSIONS

- The results and recommendation of this MTIA indicates that the proposed development can be accommodated within the existing transportation network. Implementation of the identified mitigation measures is recommended to improve the safety and Q/LOS for the existing, background and proposed site generated trips.

FIGURES

DRAFT

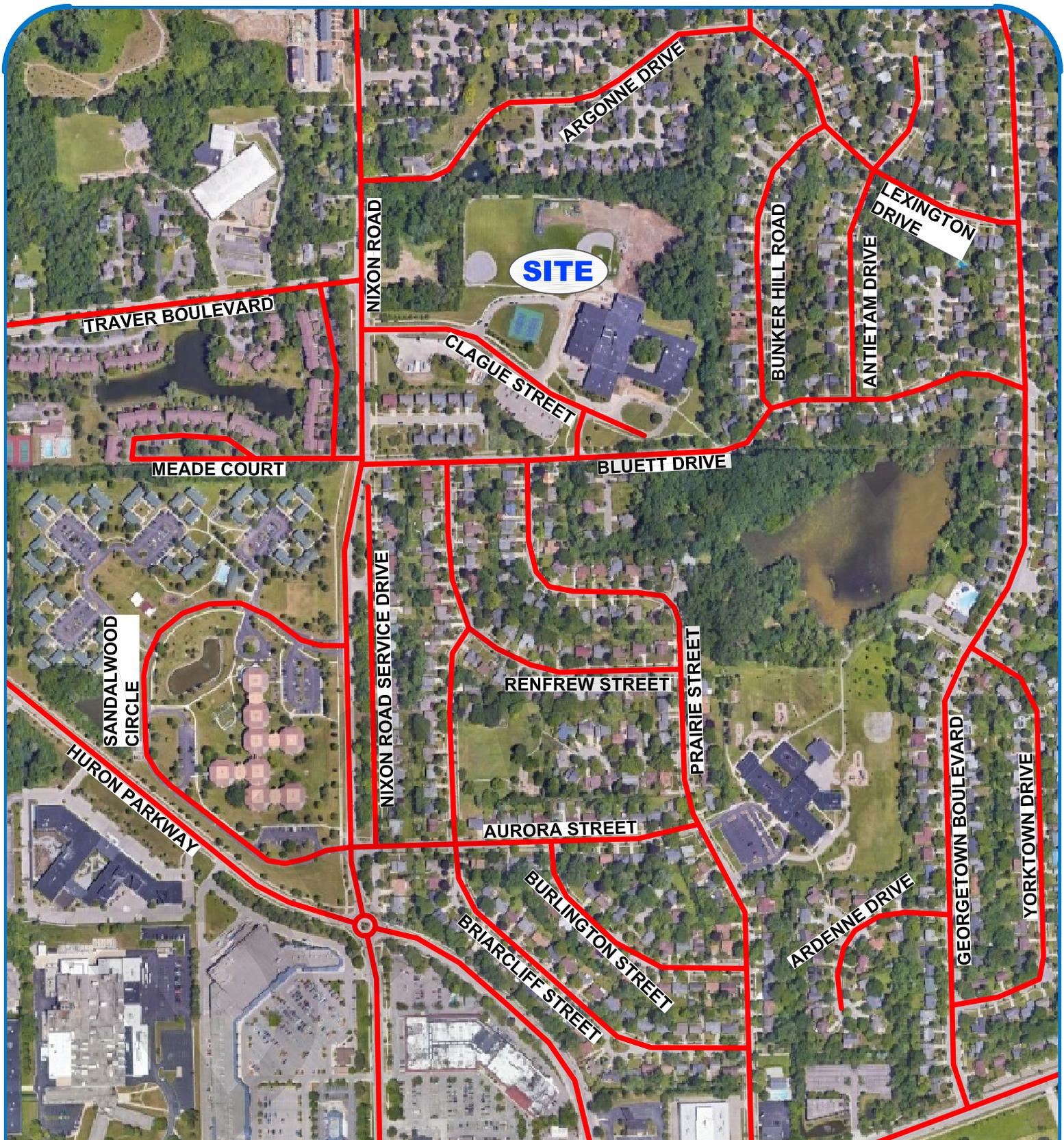


FIGURE 1

LOGAN ES SITE LOCATION

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

 SITE LOCATION



NORTH
SCALE: NOT TO SCALE

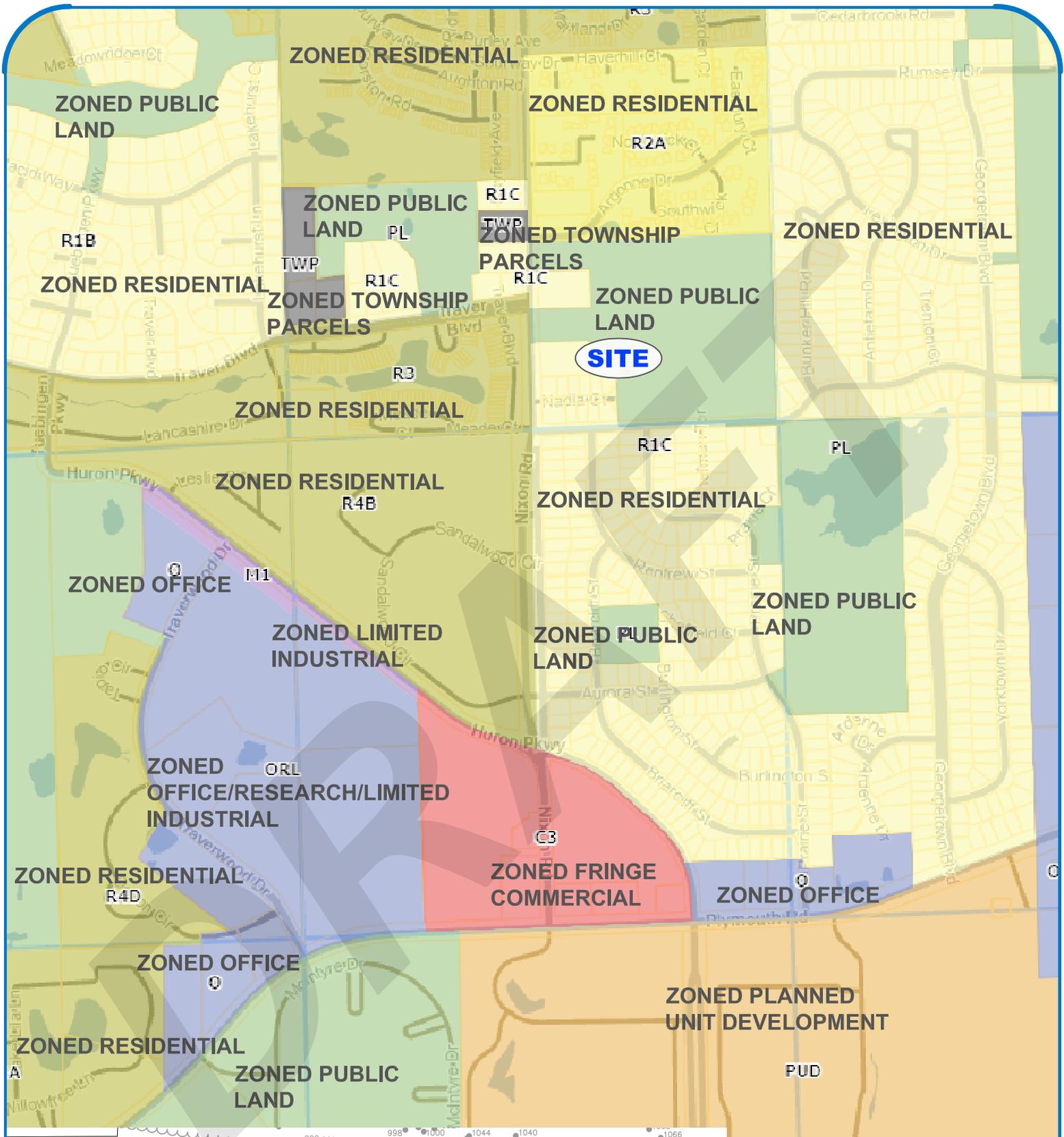


FIGURE 2

LOGAN ES ZONING MAP

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

SITE SITE LOCATION



NORTH
SCALE: NOT TO SCALE



FIGURE 3

**LOGAN ES MULTI-MODAL
CIRCULATION PLAN**

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- EXISTING SIDEWALK
- EXISTING CROSSWALK
- - - EXISTING BIKE LANE
-  BUS STOP
-  SITE LOCATION
-  NORTH
- SCALE: NOT TO SCALE

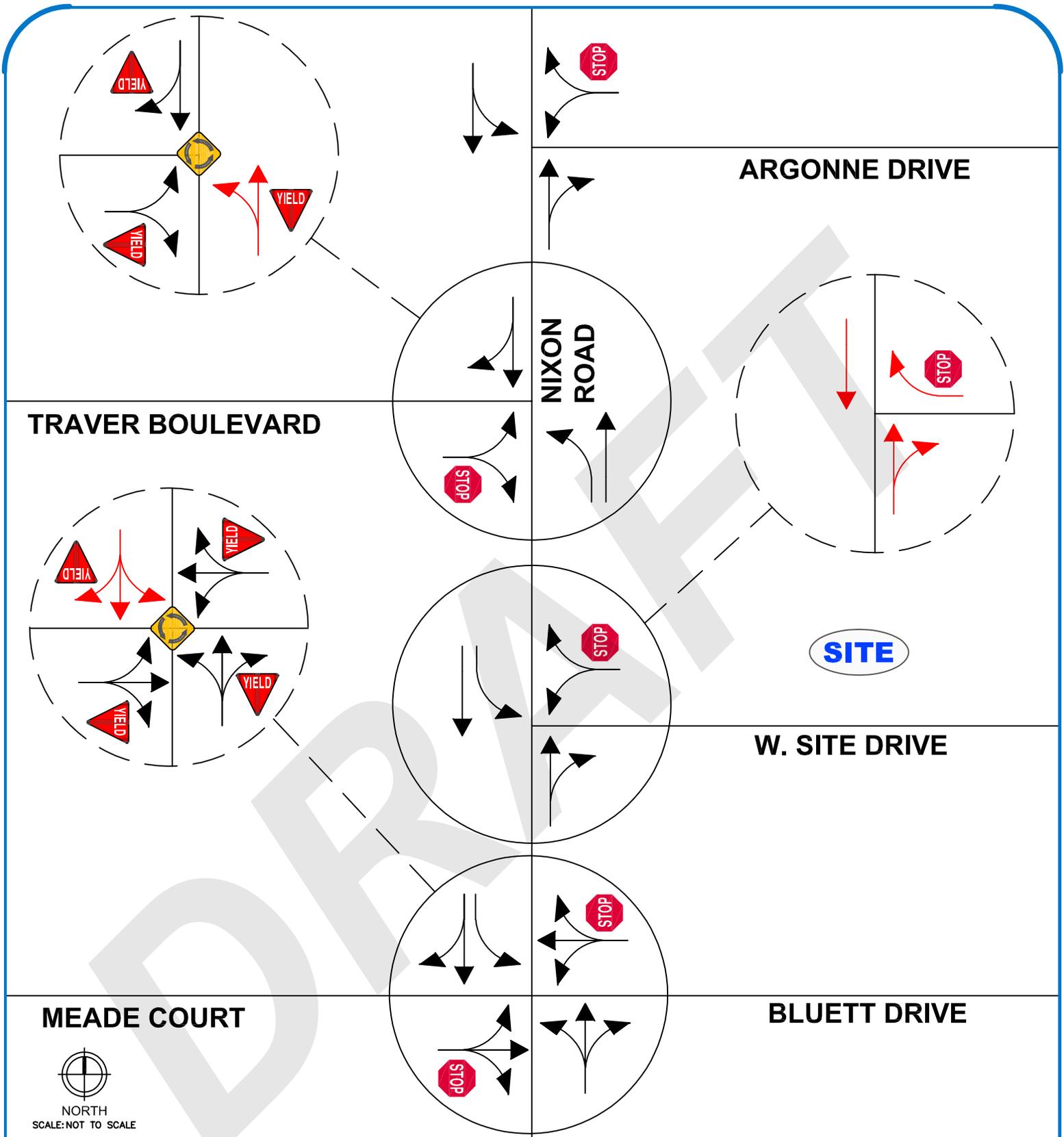


FIGURE 4

LOGAN ES LANE USE AND TRAFFIC CONTROL

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI

LEGEND	
	ROADS
	PROPOSED ROADS
	LANE USE
	PROPOSED LANE USE
	SIGNALIZED INTERSECTION
	STOP-CONTROLLED INTERSECTION
	ROUNDABOUT INTERSECTION

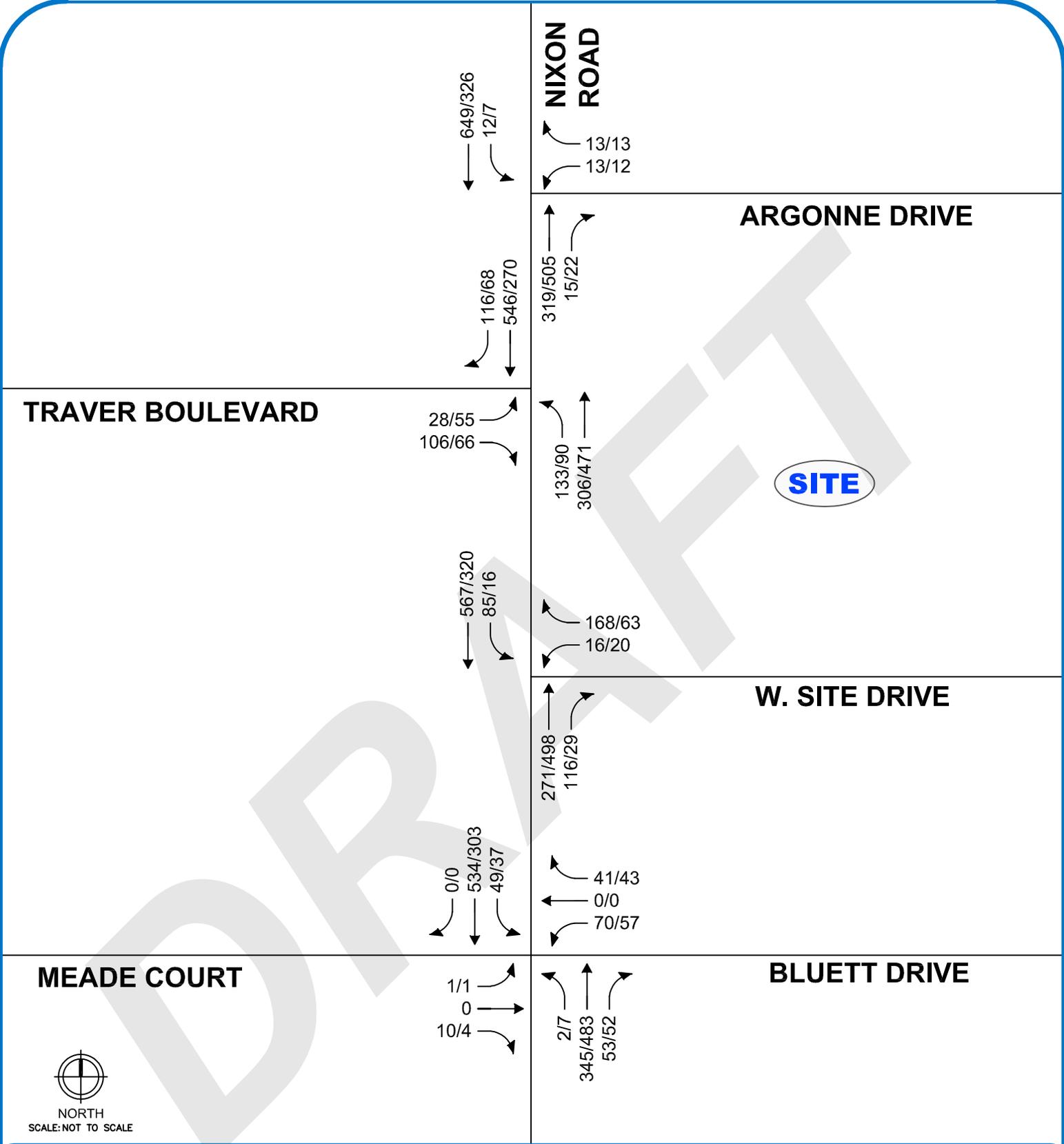


FIGURE 5A

**LOGAN ES EXISTING
VEHICLE VOLUMES**

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- VEHICLE VOLUMES (SCHOOL AM/SCHOOL PM)

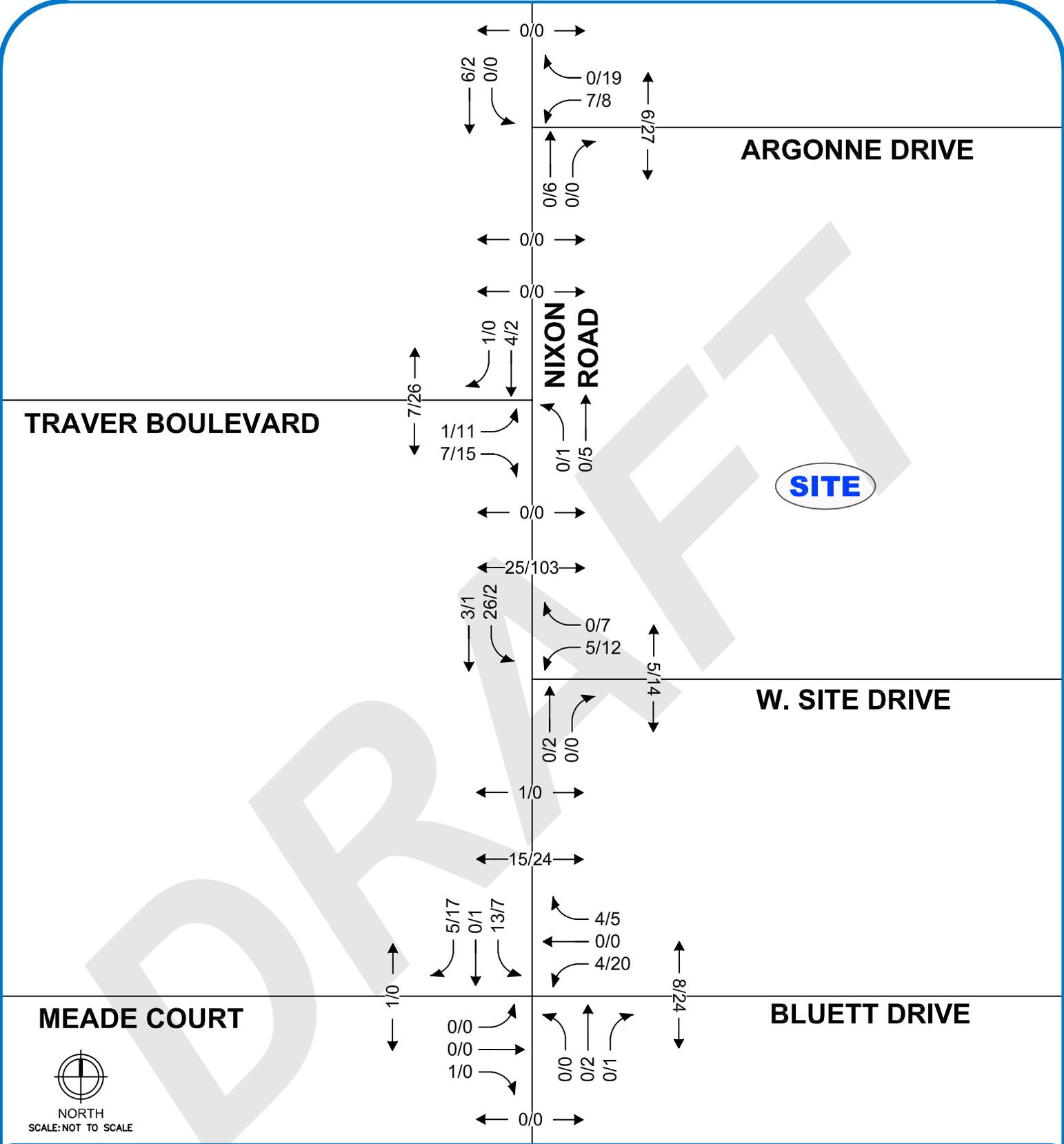


FIGURE 5B

LOGAN ES EXISTING PEDESTRIAN & BICYCLE VOLUMES

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- BICYCLE VOLUMES (SCHOOL AM/SCHOOL PM)
- PEDESTRIAN VOLUMES (SCHOOL AM/SCHOOL PM)

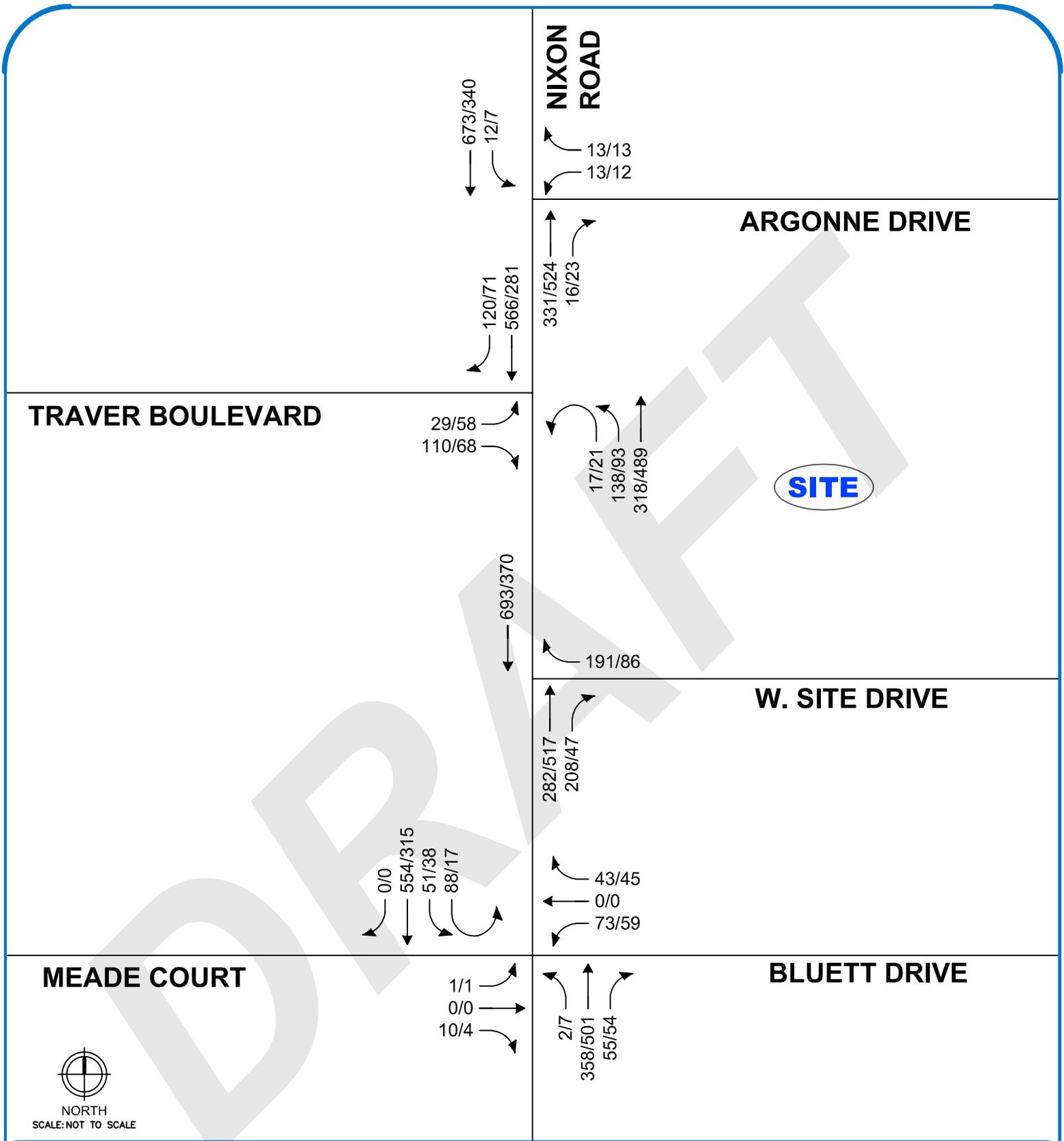


FIGURE 6A

LOGAN ES BACKGROUND VEHICLE VOLUMES

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- PROPOSED ROADS
- VEHICLE VOLUMES (School AM/School PM)

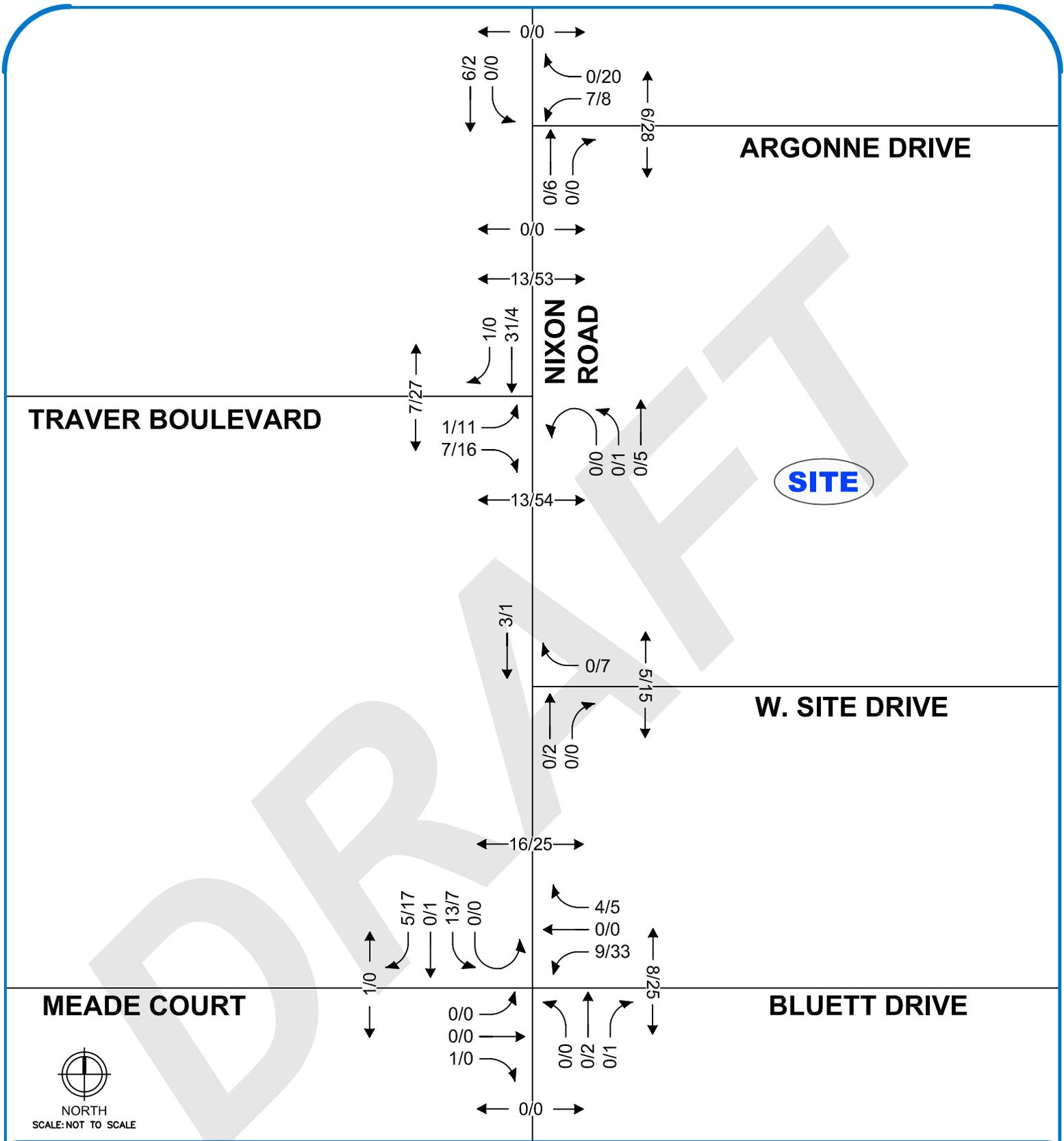


FIGURE 6B

**LOGAN ES BACKGROUND
PEDESTRIAN & BICYCLE VOLUMES**

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



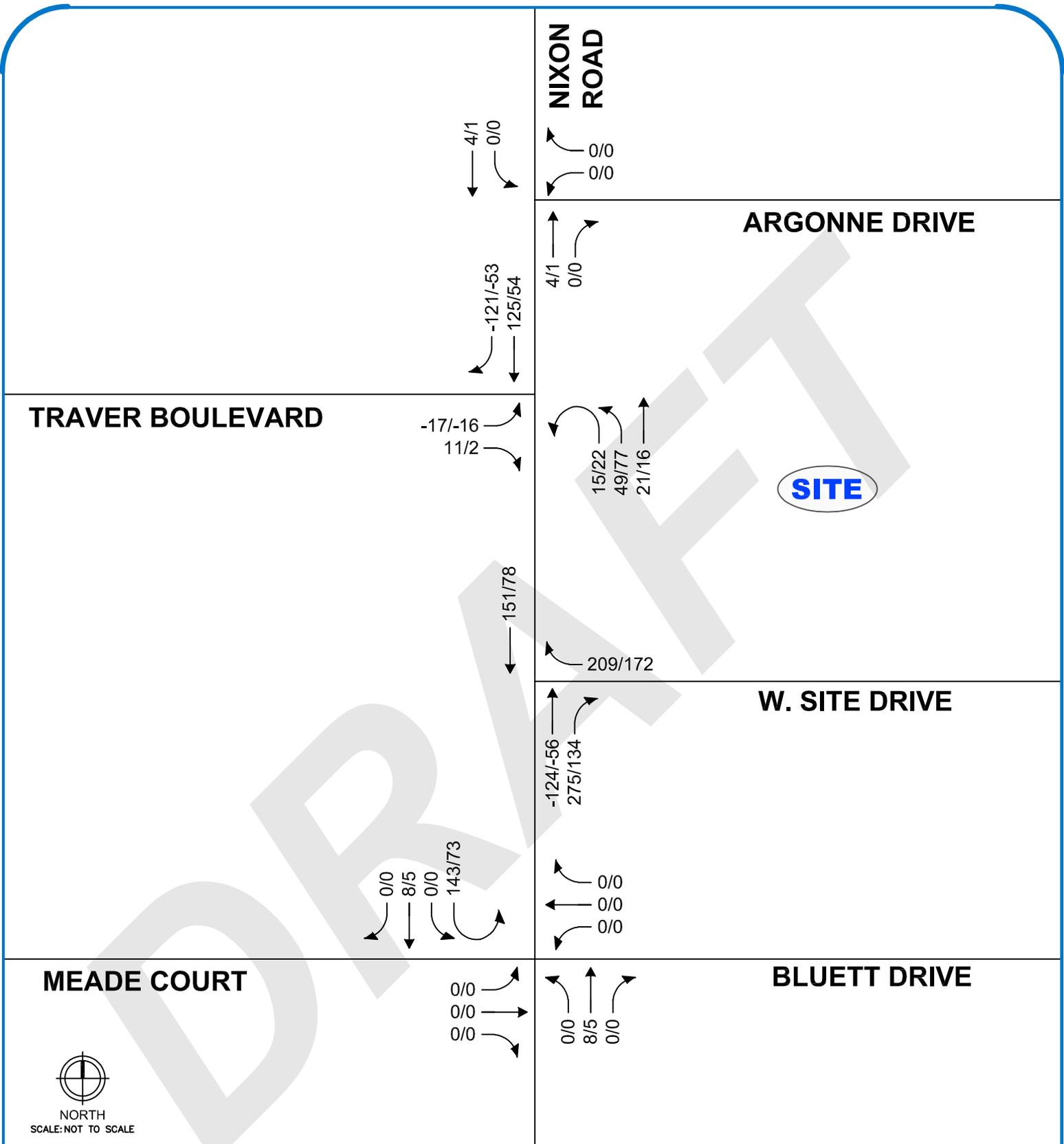


FIGURE 7A
LOGAN ES SITE-GENERATED /
REDISTRIBUTED VEHICLE
VOLUMES

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- TRAFFIC VOLUMES (School AM/School PM)

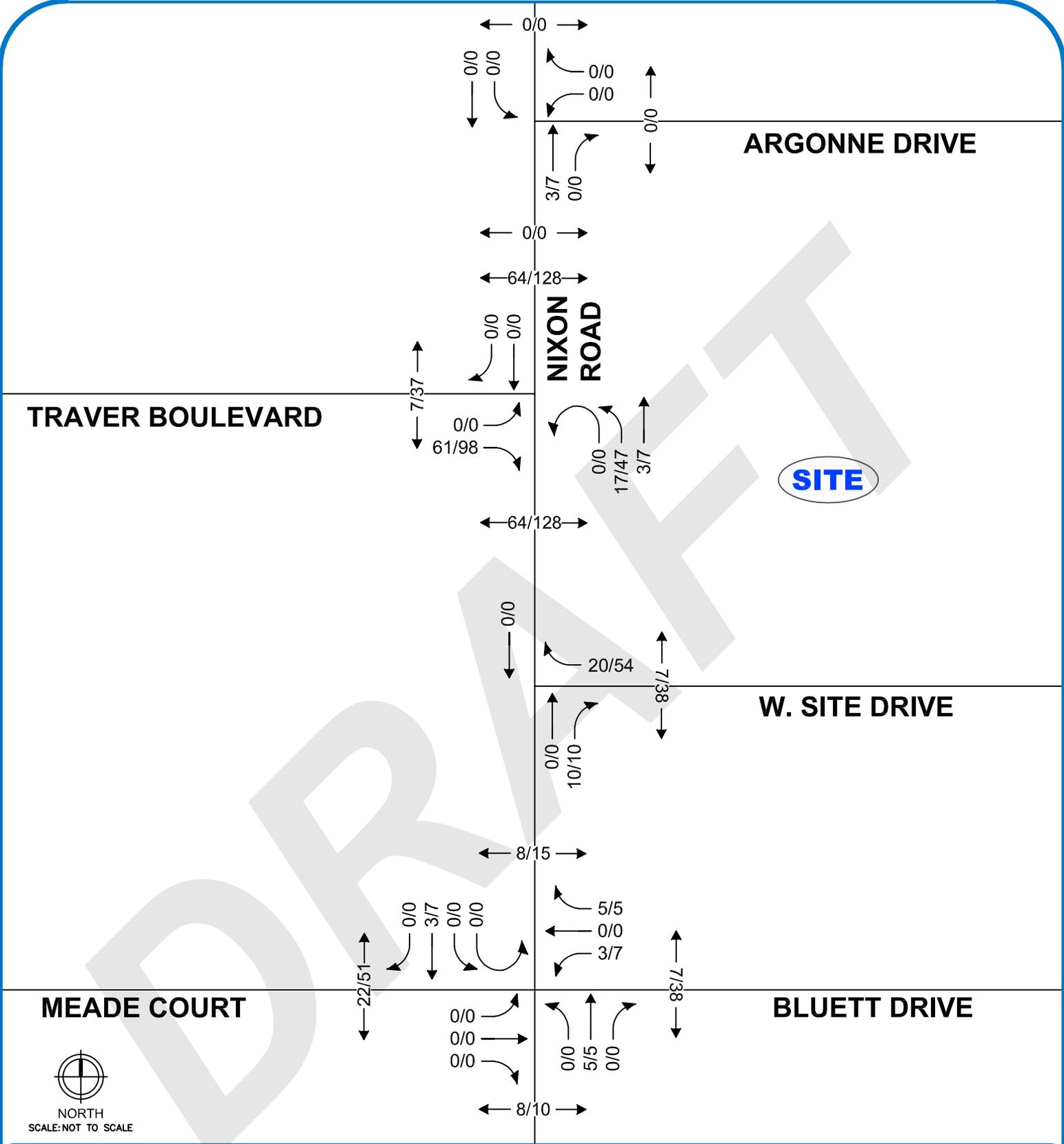


FIGURE 7B
LOGAN ES SITE-GENERATED /
REDISTRIBUTED PEDESTRIAN &
BICYCLE VOLUMES
 ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

	ROADS
	PROPOSED ROADS
	BICYCLE VOLUMES (School AM/School PM)
	PEDESTRIAN VOLUMES (School AM/School PM)

Note:

- Combined Logan ES & Clague MS.
- No King ES

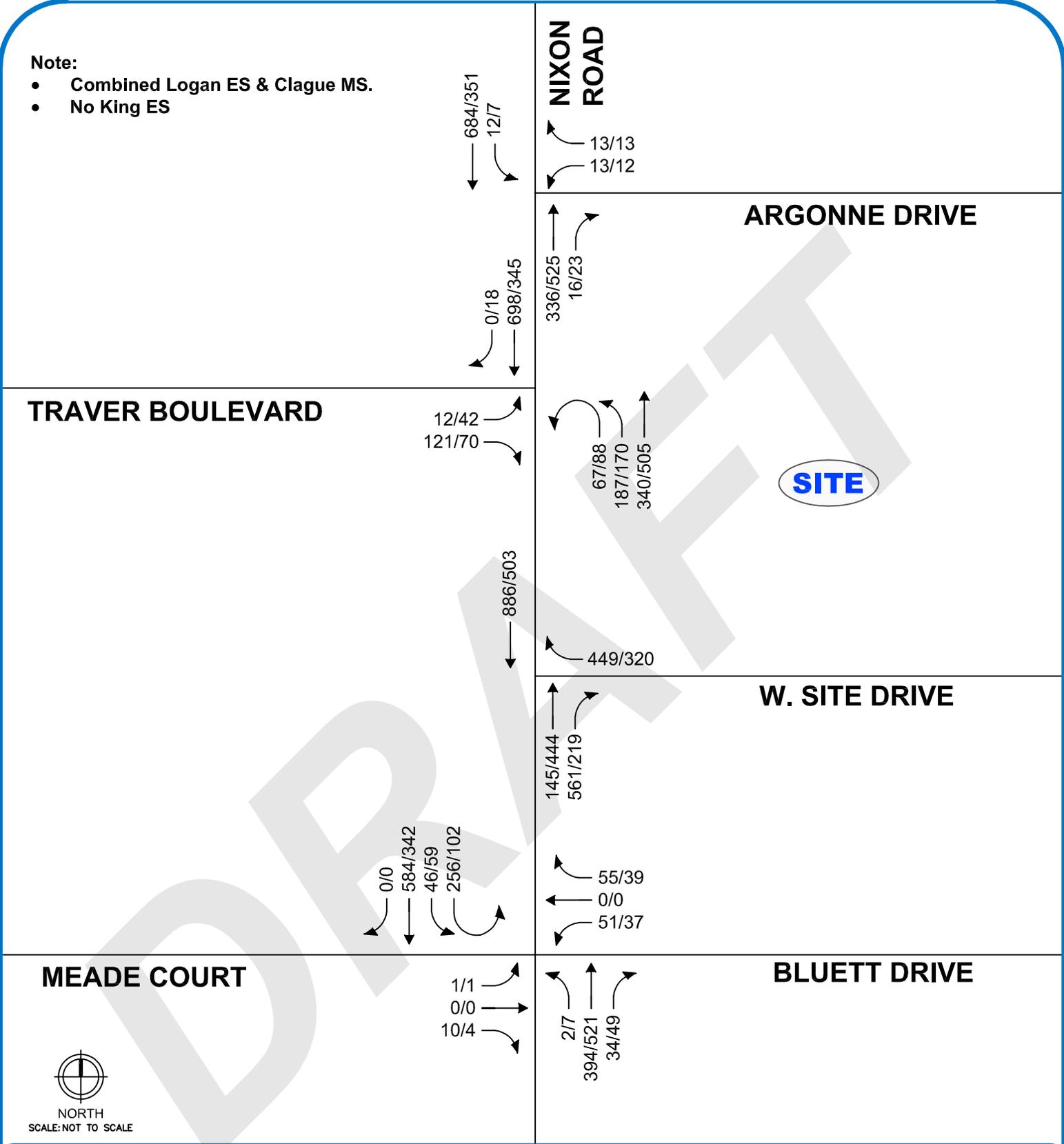


FIGURE 8A
LOGAN ES FUTURE VEHICLE
VOLUMES - 1

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

Note:

- Combined Logan ES & Clague MS.
- King ES added.

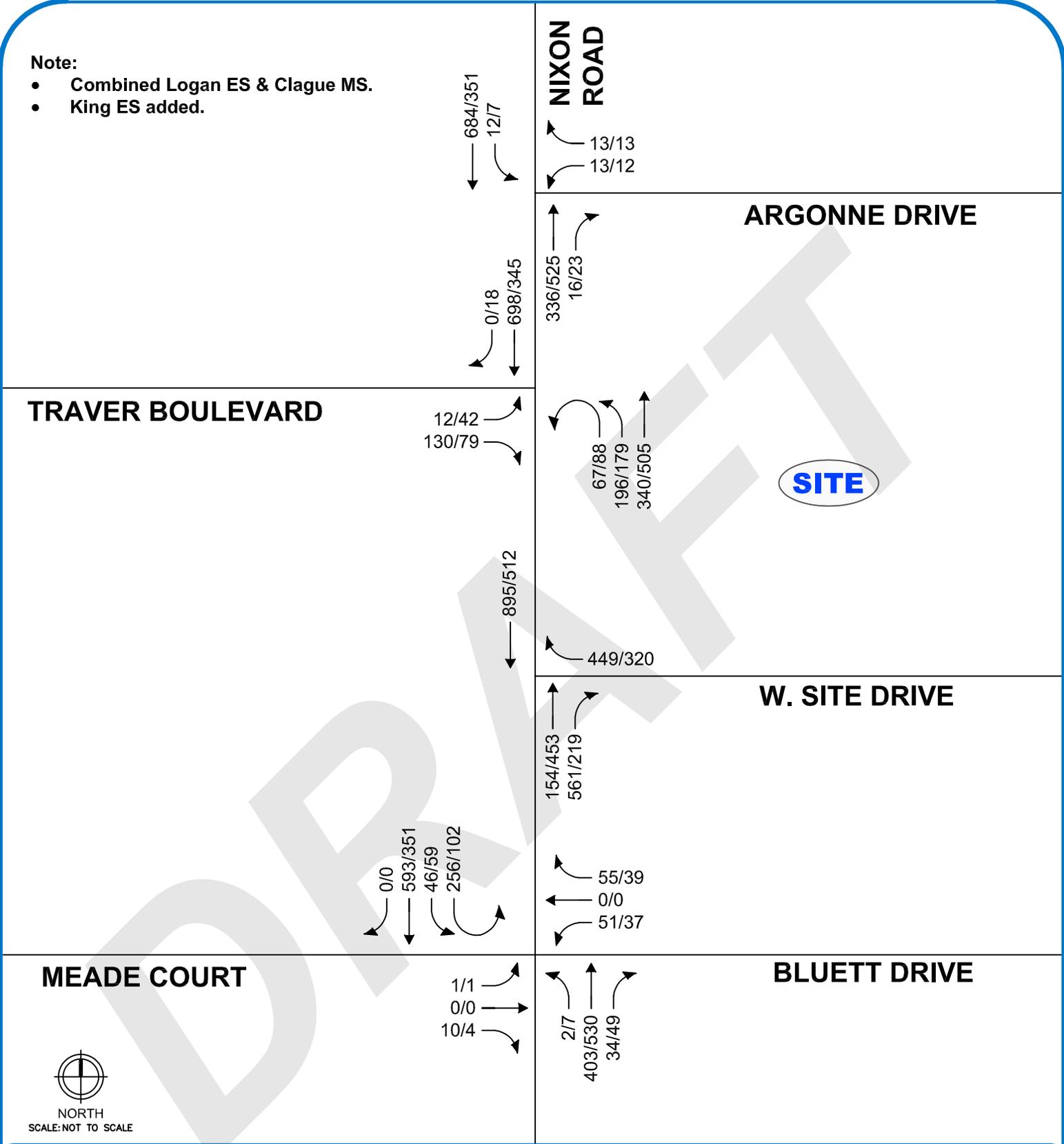


FIGURE 8B
LOGAN ES FUTURE VEHICLE
VOLUMES - 2

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

Note:

- Combined Logan ES & Clague MS.
- No King ES.
- Exit-only access added on Bluett Drive.

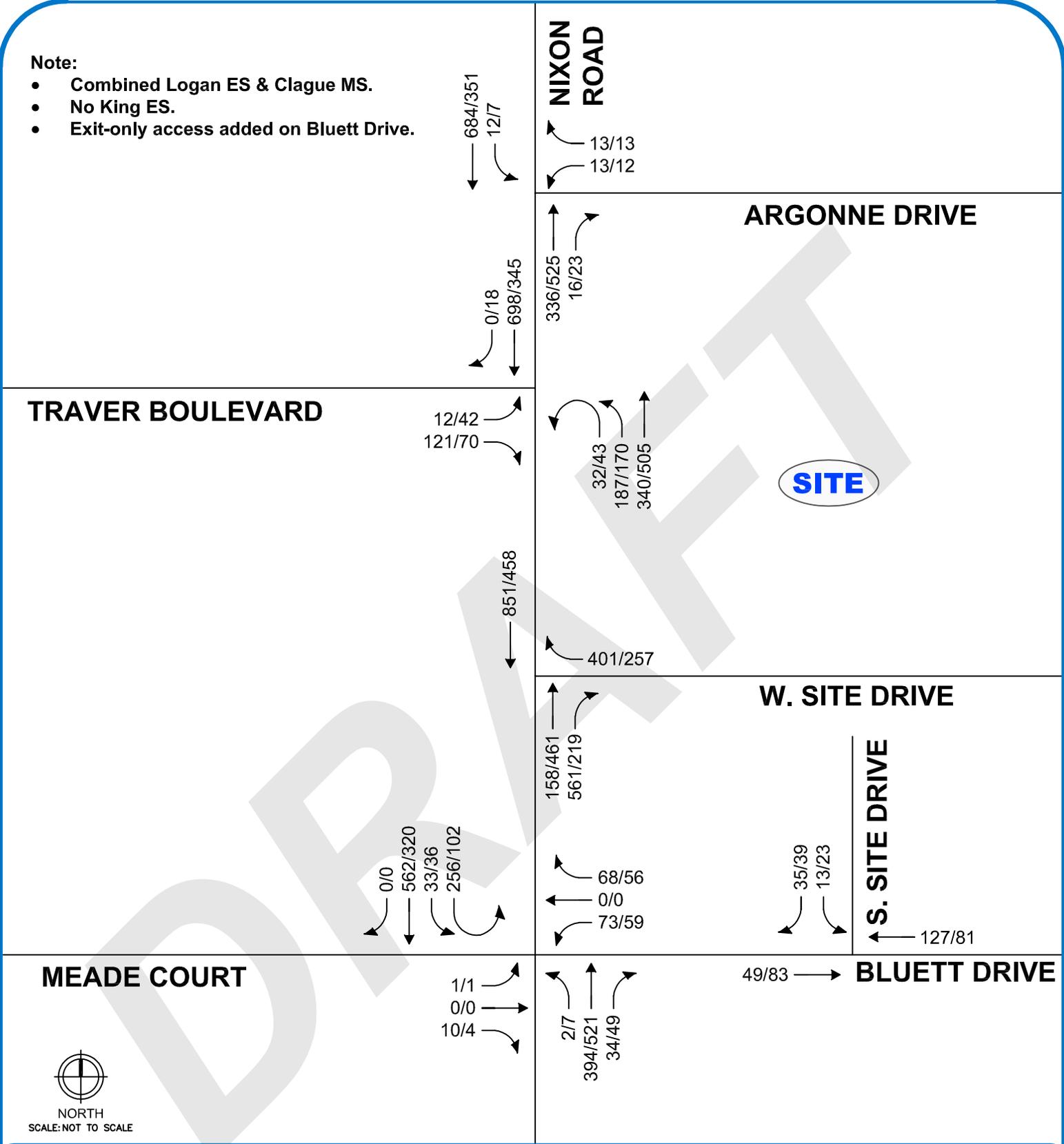


FIGURE 8C
LOGAN ES FUTURE VEHICLE
VOLUMES - 3

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

Note:

- Combined Logan ES & Clague MS.
- King ES added.
- Exit-only access added on Bluett Drive.

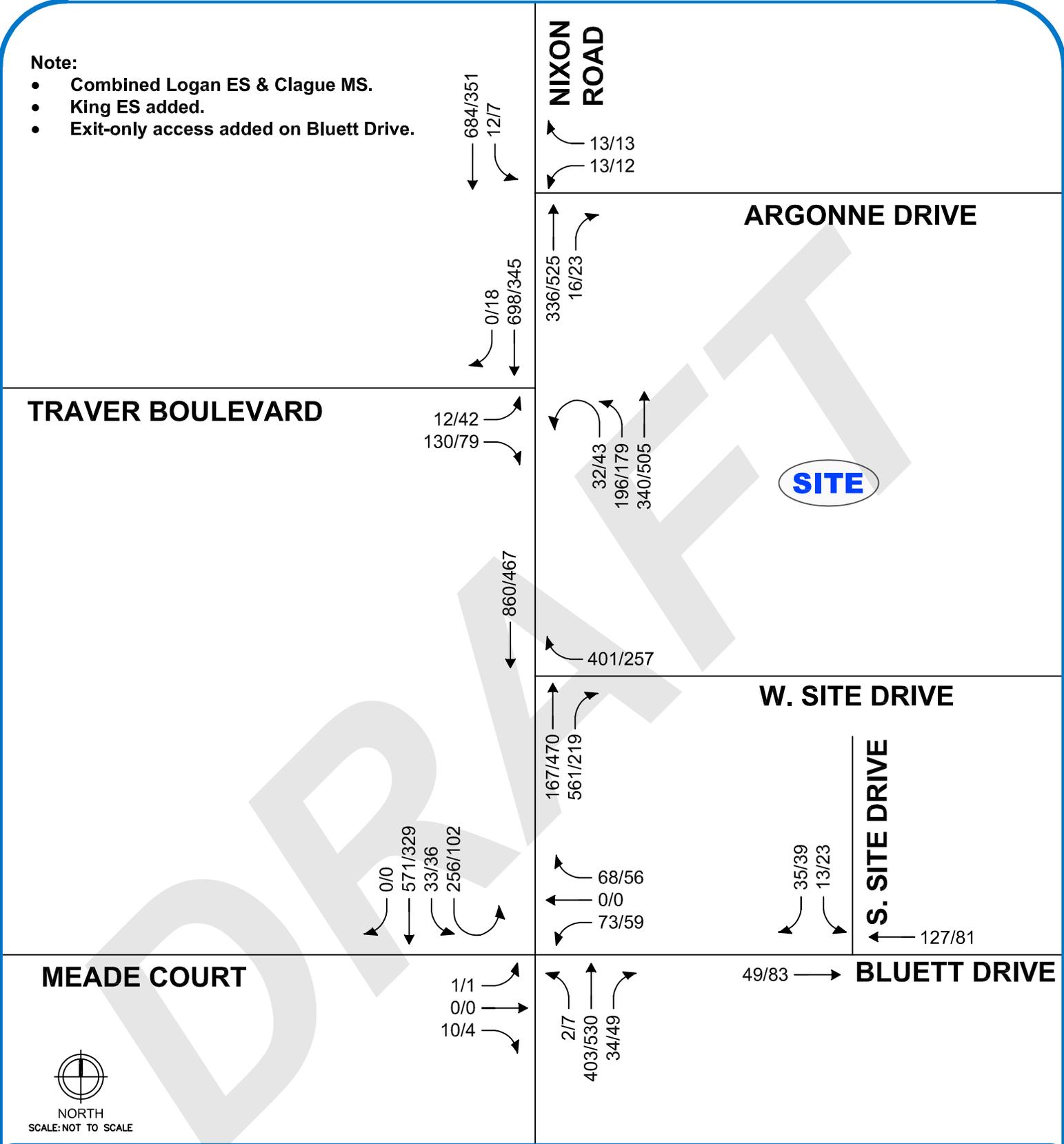


FIGURE 8D
LOGAN ES FUTURE VEHICLE
VOLUMES - 4

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

Note:

- Separate Logan ES only.

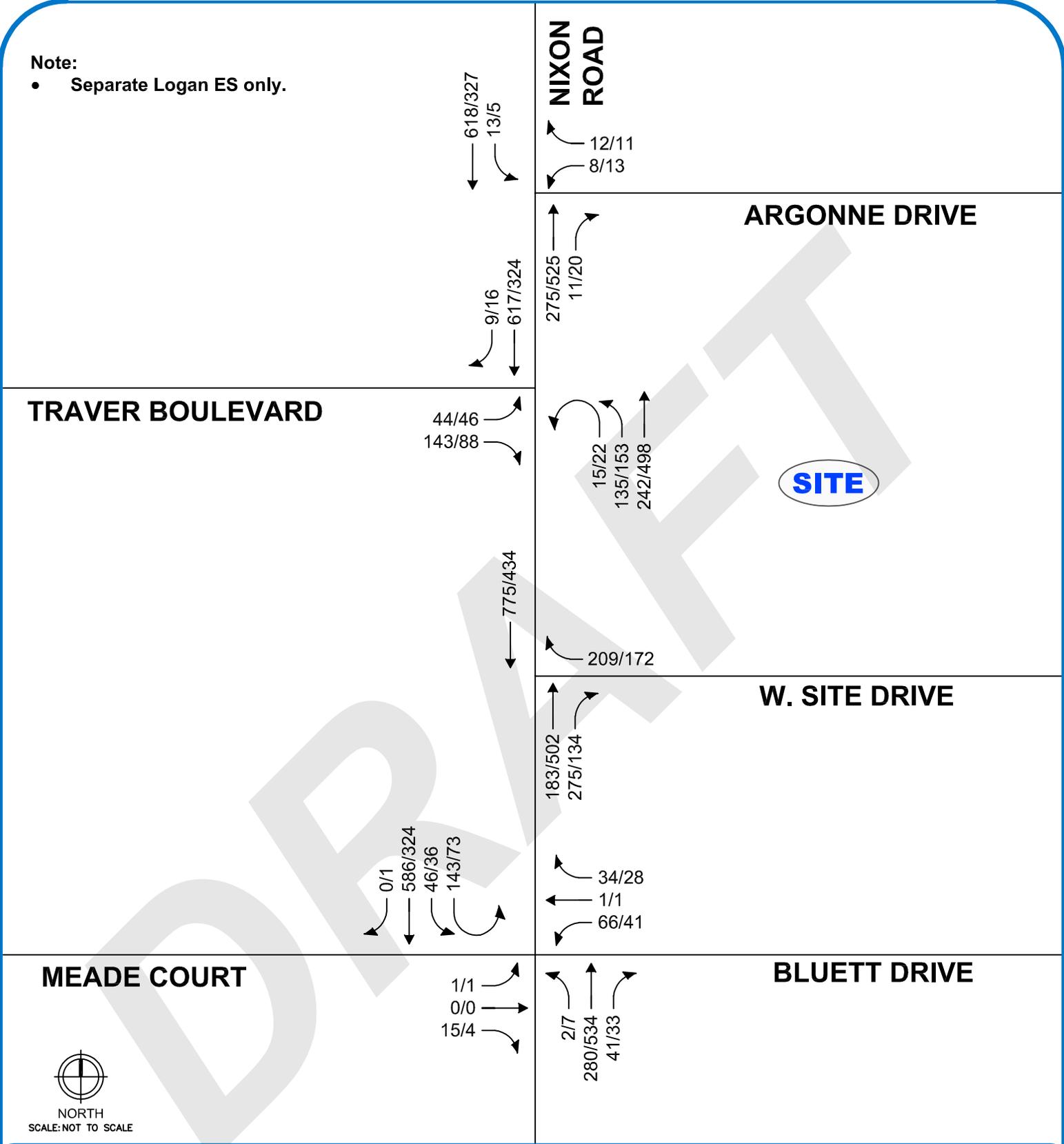


FIGURE 8E LOGAN ES FUTURE VEHICLE VOLUMES - 5

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI

LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

Note:

- Separate Clague MS only.

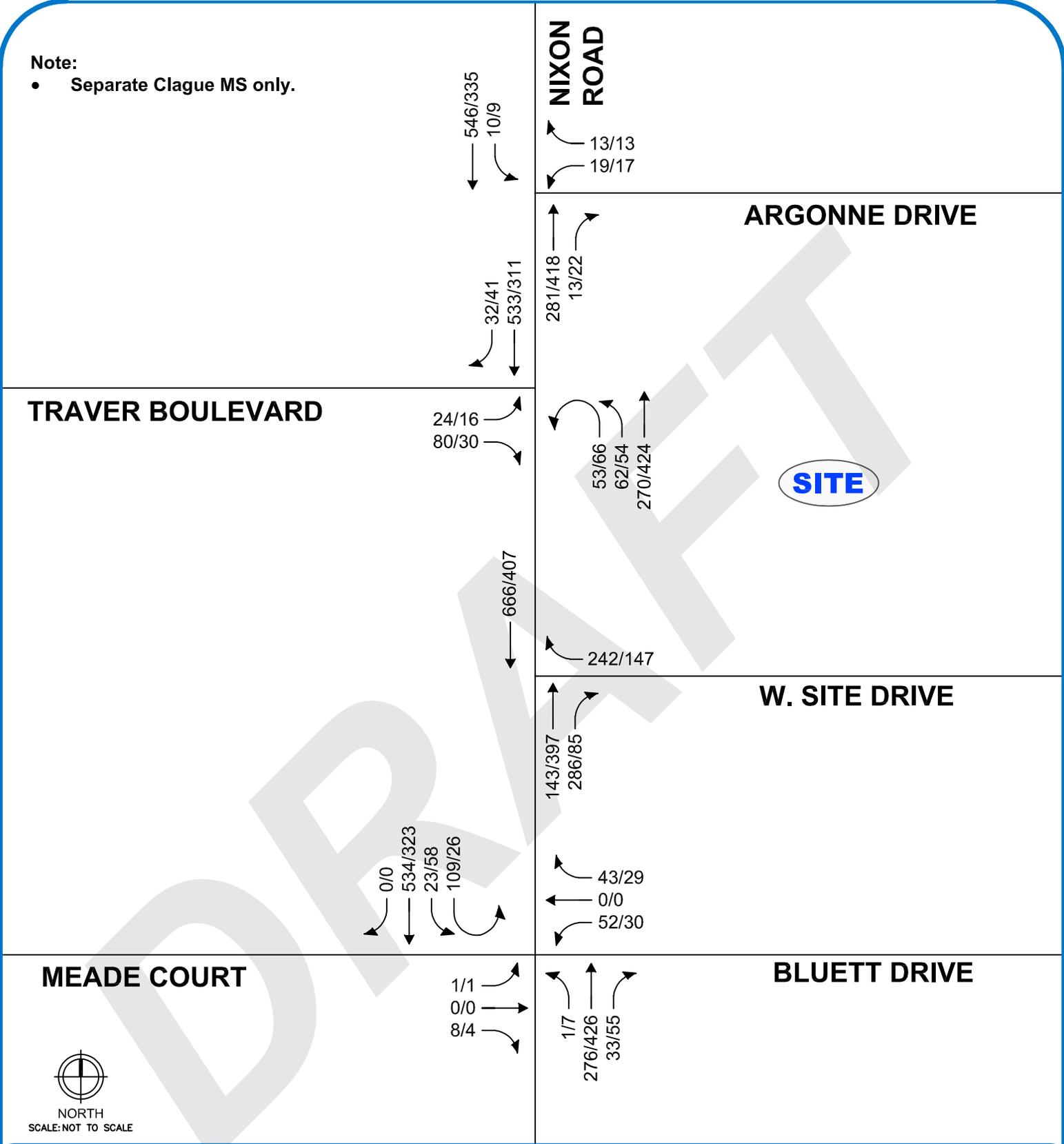


FIGURE 8F

LOGAN ES FUTURE VEHICLE VOLUMES - 6

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ||||| VEHICLE VOLUMES (School AM/School PM)

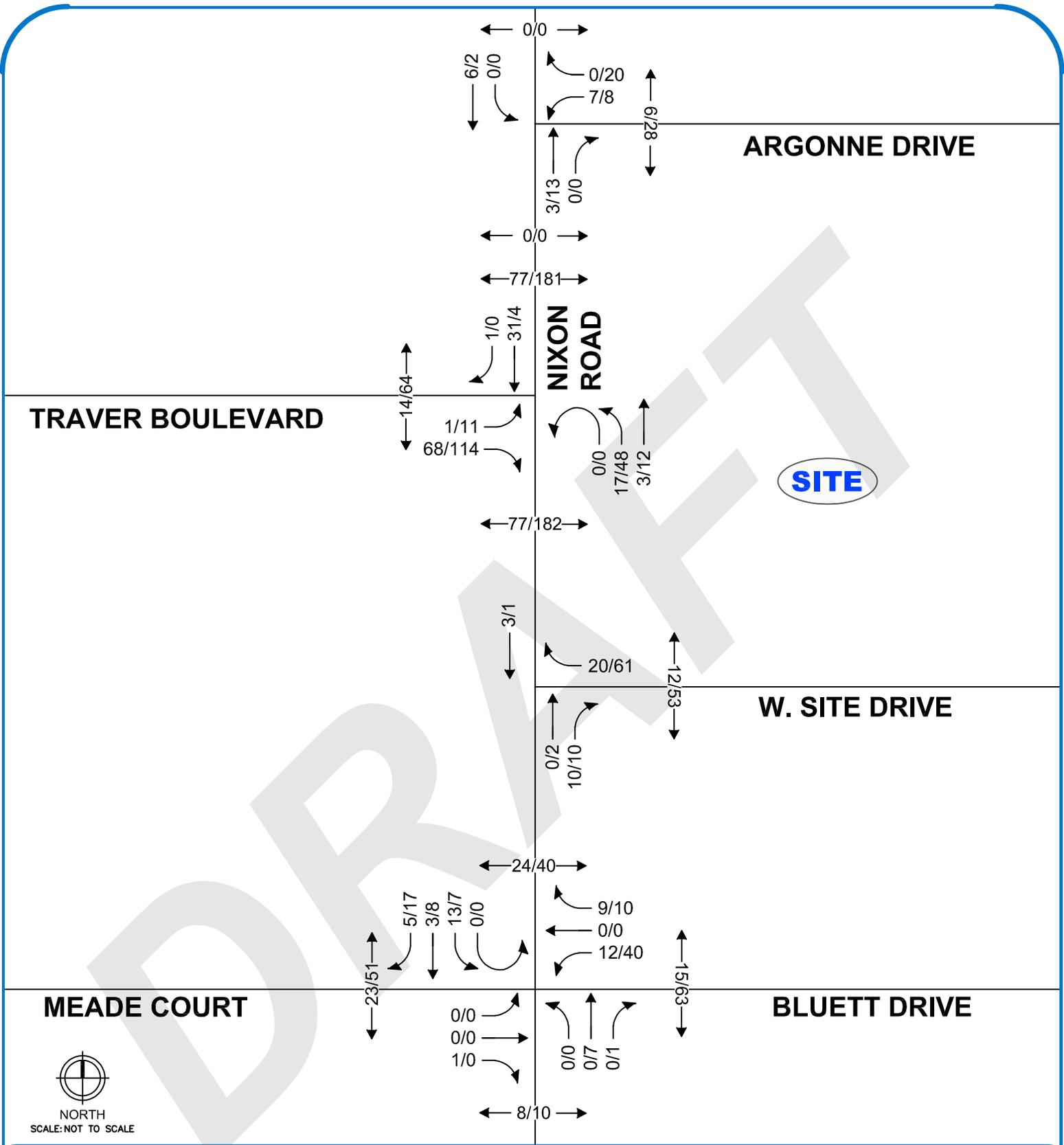


FIGURE 8G
LOGAN ES FUTURE PEDESTRIAN
& BICYCLE VOLUMES

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



- LEGEND**
- ROADS
 - - - PROPOSED ROADS
 - ||||| BICYCLE VOLUMES (School AM/School PM)
 - ||||| PEDESTRIAN VOLUMES (School AM/School PM)

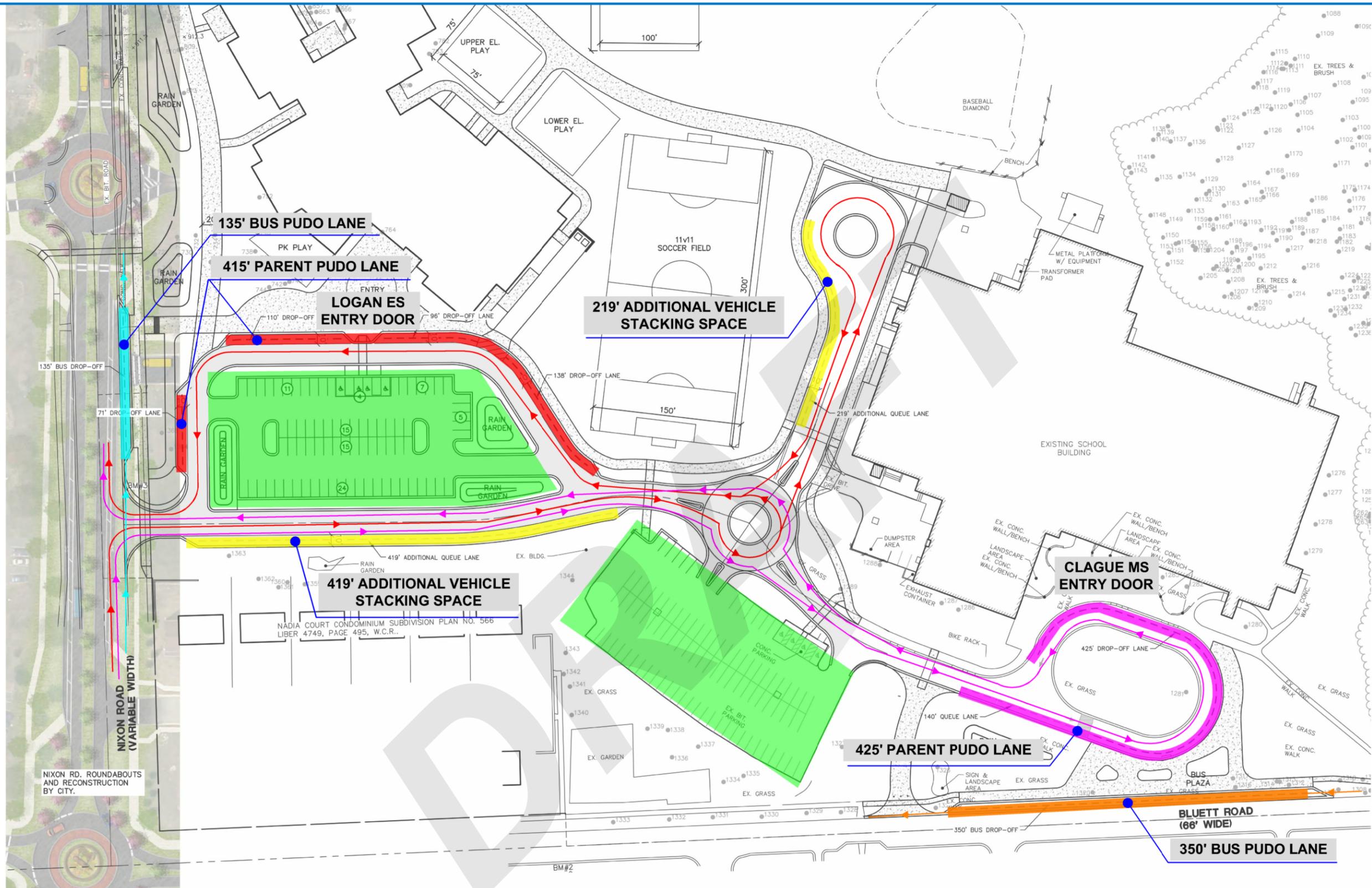


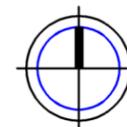
FIGURE 9A

PROPOSED LOGAN ES & CLAGUE MS PUDO OPERATIONS

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI

LEGEND

- █ LOGAN ES PARENT PUDO
- █ CLAGUE MS PARENT PUDO
- █ ADDITIONAL PARENT PUDO STACKING SPACE
- █ LOGAN ES BUS PUDO
- █ CLAGUE MS BUS PUDO
- █ STAFF/PARENT PARKING



NORTH
SCALE: NOT TO SCALE



V:\23244\Schematic Design\23244TIS.dwg, 9/25/2023 4:05 PM, Jeremy A. Mothel, C200 SITE LAYOUT & DIMENSIONAL PLAN, MCLLC PDF.p3
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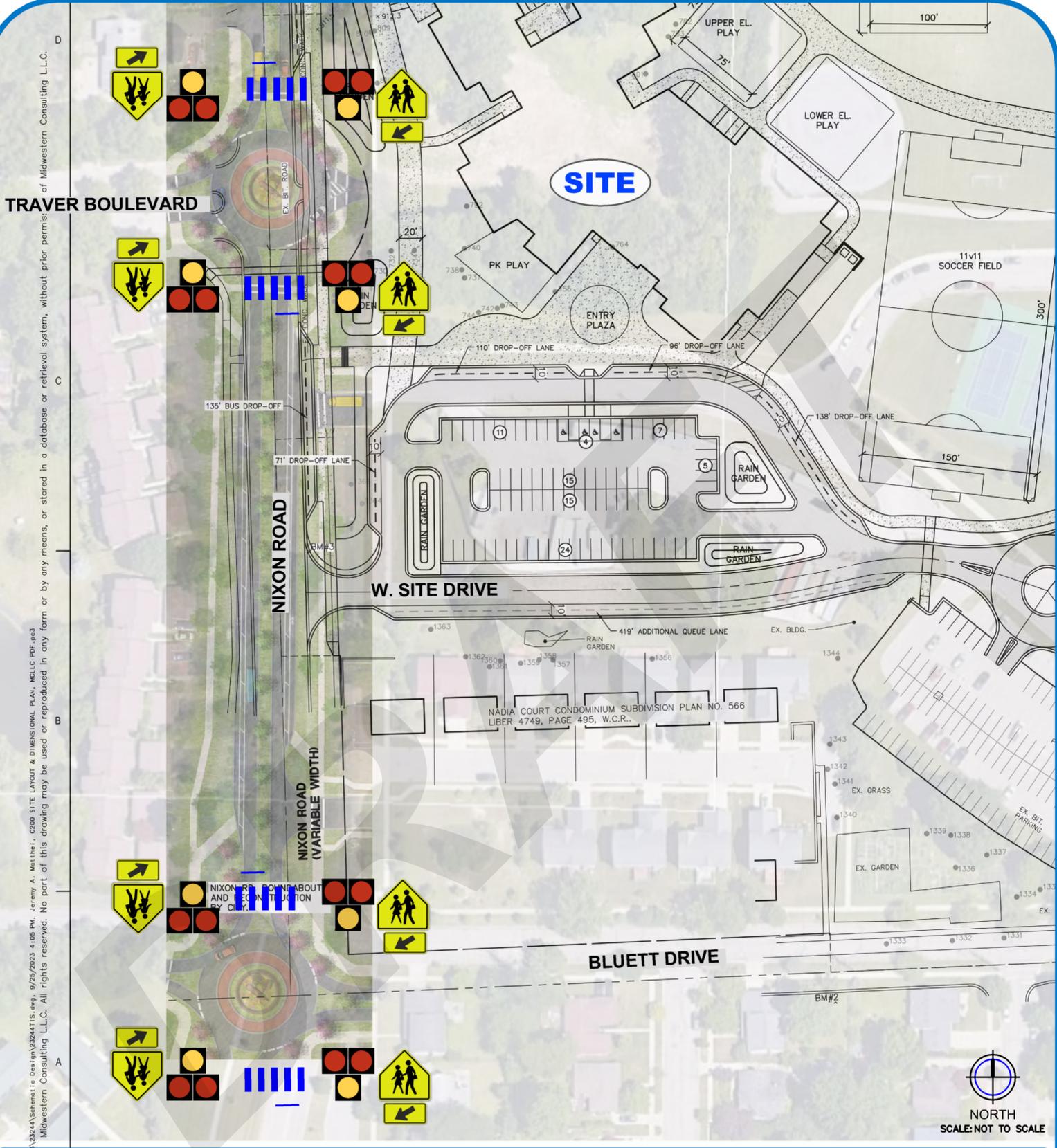


FIGURE 9B
LOGAN ES PEDESTRIAN
IMPROVEMENTS

ANN ARBOR PUBLIC SCHOOLS MTIA - ANN ARBOR, MI



LEGEND

- 
 CROSSWALK MARKINGS
- 
 PEDESTRIAN HYBRID BEACON (PHB)
- 
 S1-1 WITH W16-7P

Appendix A

BACKGROUND INFORMATION

Appendix B

EXISTING TRAFFIC CONDITIONS

Appendix C

BACKGROUND TRAFFIC CONDITIONS

Appendix D

FUTURE TRAFFIC CONDITIONS