Appendix F
Transportation Study

Traffic and Transportation Technical Report

MRES Toronto Power Plant

Missouri River Energy Services
October 11, 2024

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Contents

Tables

Figures

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1.0 General Information

This technical assessment of the transportation infrastructure is being provided as general guidance as MRES Toronto Power Plant explores the development of a new power facility in Deuel County. The site is located approximately 2 miles north and 1 mile east of Toronto, SD at the corner of 479th Avenue and 192nd Street. The project site is in Section 7, T113N, R48W. Note that a similar transportation study was completed for a nearby Astoria Power Station in June 2017. Assumptions and methods guiding that study were also applied to this study.

2.0 Existing Conditions

2.1 Traffic Volumes

Deuel County is rural in nature and supports the communities of Toronto, Clear Lake, Brandt, and Astoria which are in close proximity to this project site. The most prevalent state, county, or local roads that serve the traffic between these communities are shown in **Table 2-1** and **Figure 2-1**.

General observation of these corridors, and the counted daily traffic volumes, indicate that traffic operates in a free flow manner. Based on the recorded volumes, only a portion of the available capacity is being used on Interstate 29 (I-29), South Dakota Highway 28 (Highway 28), and South Dakota Highway 15 (Highway 15).

Table 2-1: Average Daily Traffic Volumes

Route	Daily Traffic (Yr.)	% Trucks
Interstate 29 South of Toronto Exit 150	9360 (2023)	29.3%
Interstate 29 North of Toronto Exit 150	8580 (2023)	25.6%
SD Hwy 28 east of SD Hwy 15	1,167 (2023)	17.2%
SD Hwy 28 west of SD Hwy 15	2,161 (2023)	12.2%
SD Hwy 15	1446 (2023)	29.9%
479th Avenue / CR 315 north of SD Hwy 28	140 (2023)	20% to 30%*
483rd Avenue / CR 311 north of SD Hwy 28	245 (2023)	20% to 30%*
478th Avenue / CR 317 south of SD Hwy 28	485 (2023)	20% to 30%*
188th Street / CR 314 east of SD Hwy 15	530 (2023)	20% to 30%*

Source: SDDOT Division of Planning and Engineering Inventory Management & Research
* Estimated

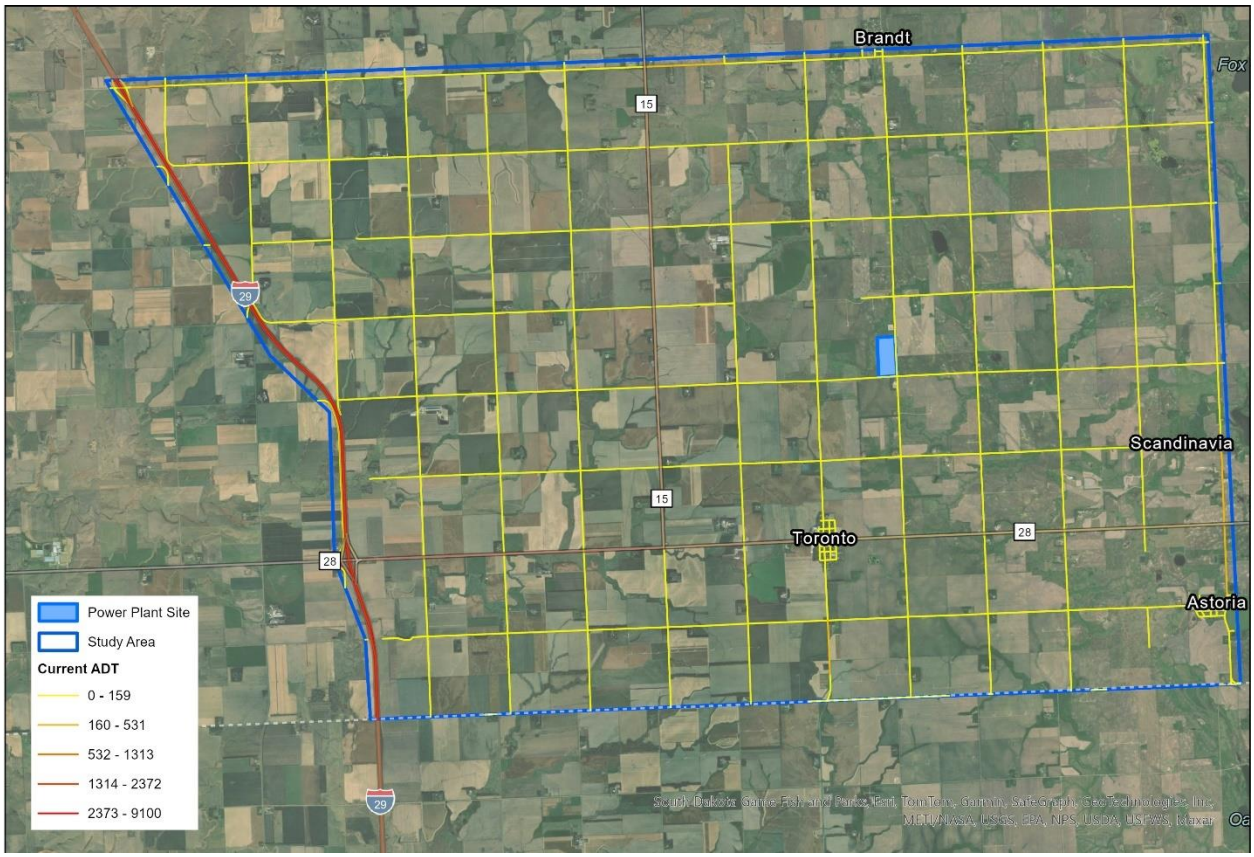


Figure 2-1: Roadway Facility Daily Volumes near MRES Toronto Power Plant

2.2 Pavement Types and Bridges

An overview of all pavement types in the study area is shown in **Figure 2-2** and an overview of structure sufficiency ratings in the study area is shown in **Figure 2-3**. **Pavement types and bridge conditions should be verified by the haulers when selecting a route.** The following is for informational purposes only.

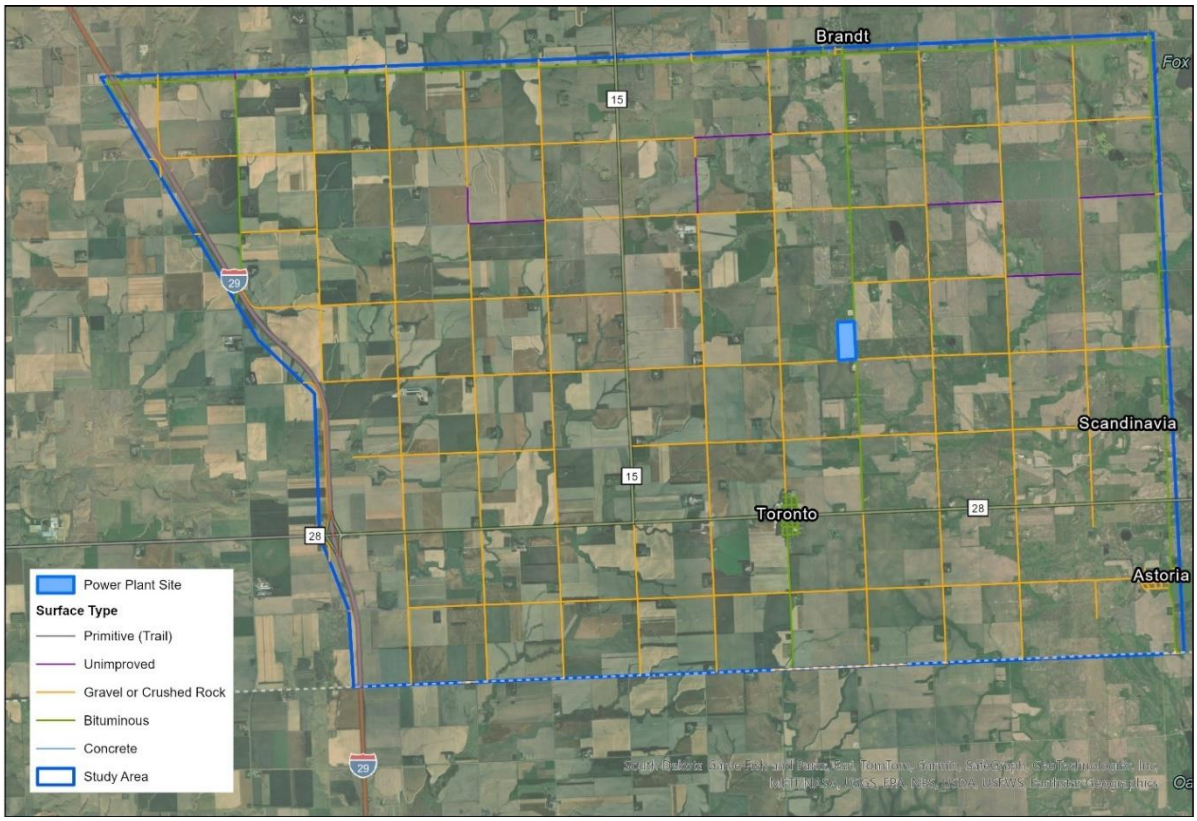


Figure 2-2: Roadway Facility Surface Types near MRES Toronto Power Plant

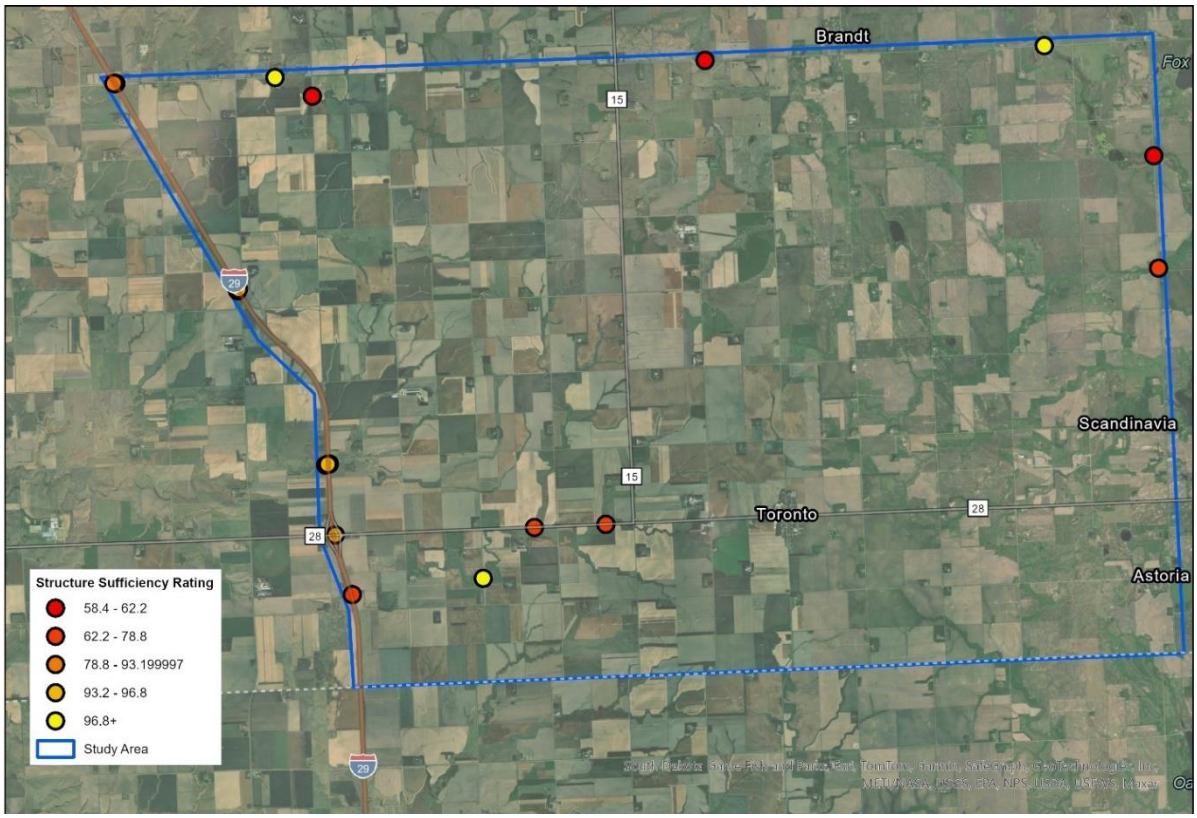


Figure 2-3: Roadway Structure Sufficiency Ratings near MRES Toronto Power Plant

2.2.1 Interstate 29

Interstate 29 within the study area is four-lane divided roadway with 12-foot lanes. Approximately 8 miles of I-29 are included in the study area from mileage reference marker (MRM) 147 to MRM 155. The surface of I-29 is concrete for the driving lanes and has asphalt shoulders ranging from 3 to 8 feet in width. Surfacing conditions appear to be in good condition. Improvements are identified in 2025, south of Highway 28, to include asphalt concrete resurfacing for the southbound lanes and asphalt surface treatment for the northbound lanes. SDDOT has identified needed maintenance on a periodic basis based on historic trends and yearly visual observations.

The bridges/structures located on I-29 within the project area are shown in **Table 2-2**.

Table 2-2: I-29 Structures in the Project Area

Structure Number	Structure Type	MRM	ADT	Sufficiency Rating
20064288	Culvert	150.06	9100	71.5
20060271	Bridge	151.85	4290	96.8
20061271	Bridge	151.85	4290	96.8
20049248	Bridge	154.50	4290	94.8
20050248	Bridge	154.50	4290	94.8

Source: SDDOT Office of Bridge Design

2.2.2 Highway 28

Highway 28 within the study area is a two-lane asphalt typical section. Approximately 12 miles of Highway 28 exists within study area. Highway 28 exhibits a two-lane asphalt typical section with shoulders widths ranging between 2 and 10 feet. Highway 28 improvements identified for 2025 and 2026, west of Highway 15, include grading, interim surfacing, replacing RCBC and approach slab (2025) and asphalt concrete surfacing, milling, and asphalt concrete resurfacing (2026). Planned Highway 28 improvements east of Highway 15 include asphalt surface treatment (2024) and urban grading, asphalt concrete resurfacing, curb and gutter, sidewalk, and lighting improvements through Toronto (2026). In general, the roadway surfacing is in good to fair shape and improvements are identified in the future years to mitigate any surfacing concerns.

Highway 28 bridges/structures located within the project area are shown in **Table 2-3**.

Table 2-3: Highway 28 Structures in the Project Area

Structure Number	Structure Type	MRM	ADT	Sufficiency Rating
20061280	Bridge	361.61	1,924	96
20086280	Culvert	364.22	1,924	74.6
20096280	Culvert	365.16	1,924	74.6

Source: SDDOT Office of Bridge Design

2.2.3 Highway 15

Highway 15 within the study area is a two-lane asphalt typical section with shoulders measuring 4 feet, or less, in width. Approximately 6 miles of Highway 15 are located within the study area. Highway 15 improvements planned for 2024 and 2025, south of Highway 28, include grading and interim surfacing (2024) and asphalt concrete resurfacing (2025). In general, roadway surfacing is in good condition and improvements are identified in the future years to address surfacing needs. One existing on-inspection structure is located between Highway 22 and Highway 28, as noted in **Table 2-4**.

Table 2-4: Highway 15 Structures between Highway 22 and Highway 28

Structure Number	Structure Type	Location	Sufficiency Rating
20100171	Bridge	1.1 miles south of SD Hwy 22 on SD Hwy 15	96.2

Source: SDDOT Office of Bridge Design

2.3 County and Township Roads and Bridges

Local roadways which could be used in facilitating construction traffic and/or a permanent workforce traveling to/from the project site are shown in **Table 2-5**. These roadways are generally located within Scandinavia or Norden Townships and provide connectivity with smaller rural communities and state routes.

The county roadways exhibit asphalt surfacing and typically exhibit a 26-foot paved surface width. Township roadways have gravel surfacing and range in width from 10 to 18 feet. In general, pavement markings on the county facilities delineate the centerline but edge markings and shoulders were not found consistently on all routes.

Table 2-5: County and Township Roadways

Roadway	Jurisdiction	Roadway Surface
483rd Ave (CR 311 / CR 42) – From south of Astoria north towards SD Hwy 22	Deuel County / Brookings County	Asphalt Surfacing
188th Street (CR 314) – SD Hwy 15 east to Minnesota Border	Deuel County	Asphalt Surfacing
479th Ave (CR 315) – Brandt, SD south to SD Hwy 28	Deuel County	Asphalt Surfacing
478th Ave (CR 317 / CR 25) – Toronto, SD south towards White, SD	Deuel County / Brookings County	Asphalt Surfacing
193rd Street – between 483rd Ave and 479th Ave	Scandinavia Township	Gravel Surfacing
192nd Street – between 483rd Ave and 479th Ave	Scandinavia Township	Gravel Surfacing
191st Street – between 483rd Ave and 479th Ave	Scandinavia Township	Gravel Surfacing
481st Avenue – SD Hwy 28 north to 193rd Street	Scandinavia Township	Gravel Surfacing
482nd Avenue – SD Hwy 28 north to 193rd Street	Scandinavia Township	Gravel Surfacing

Source: SDDOT Office of Inventory Management and Research

Several of the Deuel County highways extend into Brookings County where they change to Brookings County-jurisdiction. If it is determined that any of these routes would experience additional, generated traffic due to construction, coordination with the Brookings County Highway Department is recommended.

The bridges/structures identified in **Table 2-6** exist on the county road facilities, are 20 feet or more in length, and inspected on a bi-annual basis.

Table 2-6: County / Township Structures in the Project Area (Routes identified as being impacted by construction or permanent workforce traffic)

Structure Number	Structure Type	Location	Sufficiency Rating
20111220	Culvert	1.2 miles east of SD Hwy 15 on 188th St / CR 314	62.2
20156220	Culvert	2.6 miles east of Brandt on 188th St / CR 314 (Cobb Creek)	99.8
20170170	Bridge	12 miles north of Astoria on 483rd Ave / CR 311	66.5
20170235	Bridge	1.5 miles south of 188th St / CR 314 on 483rd Ave / CR 311 (Cobb Creek)	58.4
20170249	Bridge	2.99 miles south of 188th St / CR 314 on 483rd Ave / CR 311	71.1

Source: SDDOT Office of Bridge Design

It should be noted that county and township roadways do have drainage crossings that are small in nature and do not meet the minimum requirements of a structure that needs to be evaluated on a bi-annual basis. These structures were not reviewed as part of this traffic study. **It is recommended that these smaller structures and culverts along potential heavy haul routes (e.g., CR 315) be inspected for condition and abnormalities prior to starting construction.**

2.4 Highway 14/Highway 14 Bypass to I-29 to Highway 28 Route

Previously, the Astoria Power Plant equipment was shipped via rail to Aurora, SD, approximately 20 miles south of Toronto, where it was offloaded to trucks before traveling to the site. A potential route from Aurora, SD, via the state highway system could include U.S. Highway 14/Highway 14 Bypass to I-29 to Highway 28. County road segment(s) between the offload site and Highway 14 need to be identified and verified by the haulers.

Pavement characteristics for this route are provided in **Table 2-7**. Structure characteristics are provided in **Table 2-8**. **All conditions should be verified by the haulers.**

Table 2-7: Highway 14/Highway 14 Bypass to I-29 to Highway 28 Route Pavement Characteristics

Segment		
Highway 14	476th Ave to Hwy 14 Bypass	2-lane highway (1 lane each direction) Driving roadway width: 40-42 ft Driving surface width: 24-28 ft Asphalt concrete
Highway 14 Bypass	Hwy 14 to I-29 Exit 133 ramps	2-lane or 3-lane highway (1 lane each direction; continuous center turn lane west of 34th Avenue) Driving roadway width: 40-62 ft Driving surface width: 36-48 ft Asphalt concrete
I-29 Exit 133 NB On-Ramp	Hwy 14 Bypass to I-29	1-lane on-ramp Driving roadway width: 24 ft Driving surface width: 12 ft Asphalt concrete
I-29	I-29 Exit 133 to Hwy 28	Multilane divided highway Northbound lanes (2): Driving roadway width: 38 ft Driving surface width: 24 ft Asphalt concrete
I-29 Exit 150 NB Off-Ramp	I-29 to Hwy 28	1-lane of-ramp Driving roadway width: 24 ft Driving surface width: 12 ft Asphalt concrete
Highway 28	I-29 Exit 150 to Toronto	2-lane highway (1 lane each direction) Driving roadway width: 26-32 ft Driving surface width: 24 ft Asphalt concrete
Highway 28	In Toronto	2-lane highway (1 lane each direction) Driving roadway width: 58 ft Driving surface width: 24 ft Portland Cement Concrete
Highway 28	Toronto to 479th Ave	2-lane highway (1 lane each direction) Driving roadway width: 32 ft Driving surface width: 24 ft Asphalt concrete

Source: SDDOT State Highway Data Viewer https://dot.sd.gov/transportation/highways/planning/gis

Table 2-8: Highway 14/Highway 14 Bypass to I-29 to Highway 28 Route Structure Characteristics

Highway	Structure Number	Structure Type	Location	Sufficiency Rating
Hwy 14	06204160	Bridge	1.9 E I 29 Interchange	98.5
Hwy 14	06201160	Bridge	1.6 E I 29 Interchange	98.5
Hwy 14B	06196156	Bridge	1.4 E I 29 Interchange	88.5
I-29	06185139	Bridge	1.1 N US14 Bypass	96.7
I-29	06185132	Culvert	1.8 N US14 Bypass	75.6 **
I-29	06185095	Culvert	1.5 S SD 30 Interchange	67.9 **
I-29	06185089	Culvert	0.9 S SD 30 Interchange	66.3 **
I-29	06185074	Bridge	0.6 N SD 30 Interchange	96.8
I-29	06185050	Bridge	3 N SD 30 Interchange	90.4
I-29	06185044	Bridge	4.4 S Deuel Co Line	96.6
I-29	06185031	Bridge	3.1 S Deuel Co Line	96.8
I-29	06185010	Bridge	1 S Deuel Co Line	90.4
I-29	20064288	Bridge	0.8 S SD 28 Interchange	71.5
Hwy 28	20086280	Culvert	1.1 W Jct SD 15	74.6
Hwy 28	20096280	Culvert	0.2 W Jct SD 15	74.6

Source: SDDOT Office of Bridge Design
Structures, starting from the top of the table working down the table, are along the potential route from Highway 14 & 476th Avenue to Highway 28 & 479th Avenue; for I-29, structures only noted for northbound direction
** Posted for load

3.0 Construction Impacts

3.1 Construction Traffic Routes

With the projected construction, a workforce traveling to the site on a periodic basis will cause some short-term traffic increases to the routes within the project area. The workforce is projected to come from several communities in and outside of the project area. Based on the *Rice Project Manpower Graph* provided for this study, around 260 workers will be on site at the peak construction period. **Table 3-1** represents an allocation of jobs to the project site based on community size and trades.

Table 3-1: Distribution of Workforce and Travel Routes Used

City / Town	Workers	Facilities Used Traveling to Site
Brookings, SD	155	I-29 to Hwy 28 to CR 315
Watertown, SD	33	I-29 to CR 314 to CR 315
White, SD	7	CR 317 to Hwy 28 to CR 315
Clear Lake, SD	13	Hwy 15 to CR 314 to CR 315
Brandt, SD	3	CR 315
Astoria, SD	3	CR 311 to Hwy 28 to CR 315
Sioux Falls, SD	16	I-29 to Hwy 28 to CR 315
Western Minnesota	30	Hwy 28 to CR 315
Totals:	260	

Source: Known workforce trades common to needs at this site and general assumptions on availability based on proximity to site. Proportion of workers/community similar to the Astoria Station Project study.

Based on these workforce estimates, it is estimated that most of the site-generated construction traffic will likely use the facilities of I-29 and Highway 28 as shown in **Table 3-2.** Both facilities can serve this additional traffic with little to no impact to the current level of service those facilities provide.

Table 3-2: Roadway Assignment for Workforce

Route	% of Workforce Using Route	One-Way Trip Increases due to Construction Workforce
Interstate 29	78%	204
SD Hwy 28	69%	211
SD Hwy 15	5%	13
CR 314 (188th Street)	18%	46
CR 317 (478th St)	3%	7
CR 315 (479th St)	100%	260

Source: Assumes best route choice from community to project site based on facility speeds and access.

3.2 Construction Site Entrances and Exits

Construction site entrance/exit drives will be on 479th Ave / CR 315, as shown in **Figure 3-1**.

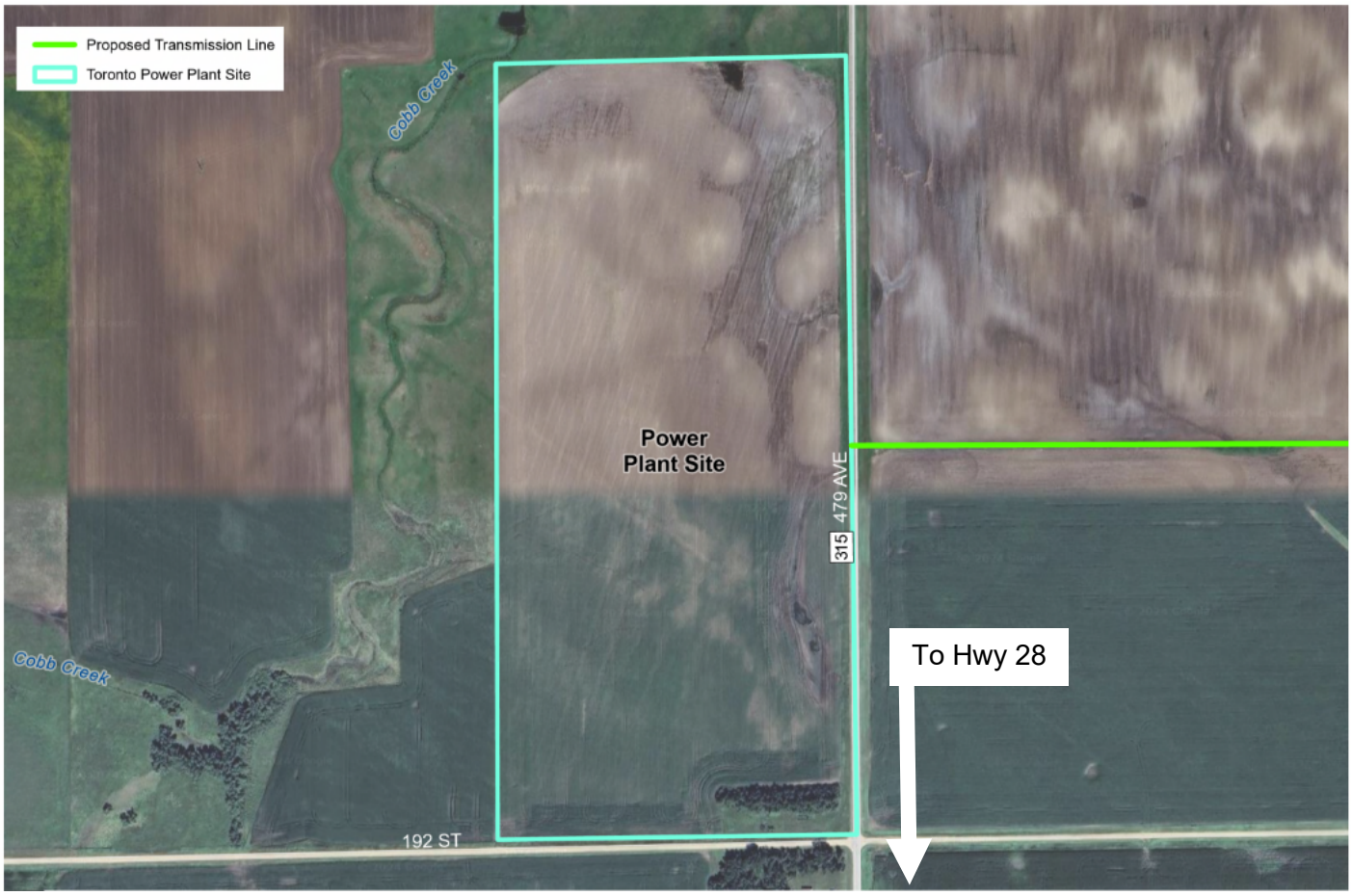


Figure 3-1: Construction Site

General recommendations for construction site entrance/exit drives and gravel road haul routes are as follows:

- Provide for a driveway width of at least 30 feet for a minimum of 300 feet back from the county highway to allow larger trucks to navigate the drive and prepare the approach for the additional site traffic.
- During construction, place truck entering/crossing signs be placed 200 feet to both sides of the project site driveway to alert other construction workforce traffic and local traffic of the increase in truck traffic.
- Develop a dust control maintenance plan for any haul routes on gravel roads.

- Develop agreements with the township and county, where applicable, for roadway maintenance during construction. The agreement should include how the roadway surface will be maintained in wet and dry conditions and dust will be controlled during construction. The agreement should also clarify township and county roles in snow maintenance during the winter months.
- If any gravel roads are considered for haul routes, a geotechnical engineer should complete an assessment of the gravel depth and structural stability. This assessment will help determine route feasibility and identify additional gravel surfacing, subgrade adjustment, or in-slope flattening needs in preparation for the additional construction traffic.

3.3 Heavy Haul and Equipment Shipment

It is expected up to 19 heavy haul loads will be delivered to the site, consisting of:

- 6 to 8 generator sets (consisting of the engine and generator, shipped separately) (12 to 16 total heavy haul loads)
- 3 GSUs (3 heavy haul loads)

Approximate weights of the heavy haul loads are provided in **Table 3-3**. **Over width and overweight permitting for heavy haulers will be necessary on state and county facilities. Heavy haulers to coordinate as necessary to obtain written permits.**

Heavy haul loads will travel by rail to the area, where they will be loaded onto trucks and delivered by truck to the site. Previously, the Astoria Power Plant equipment was shipped via rail to Aurora, SD, approximately 20 miles south of Toronto, where it was offloaded to trucks before traveling to the site. Another option identified by MRES is Labolt, SD, which is approximately 35 miles north of Toronto.

Trucked shipments from Aurora, SD, would likely travel to the study area via Highway 14 to I-29 to Highway 28. The final route from Highway 28 will be 479th Ave / CR 315, which is an asphalt-paved county road.

Table 3-3: Heavy Haul Load Summary (Transport Weights)

Heavy Haul Load	Transport Weight	Site Trailer Description
Engine block	650,100 lbs	5.0 MT / SQM (1100 PSF)
Generator	160,000 lbs	6.5 MT / SQM (1430 PSF)
GSU	490,000 lbs	6.5 MT / SQM (1430 PSF)

Source: Stanley Consultants email dated July 7, 2024, and MRES email dated September 4, 2024

3.4 Operational Impacts Due to Construction Traffic

It is anticipated that the primary routes for construction to/from the proposed site will include I-29, Highway 28, and 479th Avenue / CR 315, as previously shown in **Table 3-2**. These routes were reviewed for capacity and turn lanes needs using SDDOT guidance.

The SDDOT Road Design Manual, Chapter 15 Traffic, provides general guidance for roadway capacity based on rural or urban setting, number of lanes, and level of service (LOS) guidelines. The estimated number of lanes, shown in **Figure 3-2**, can be used to assess operational acceptability at the daily-volume level. The table suggests capacity for a 2-lane rural highway is approximately 8,000 vehicles per day.

Total Number of Lanes	Total Design Year ADT [1]	
	Rural Level	Urban
2	< 8,000	< 2,500
3	[2]	2,500 to 16,000
4	8,000 to 20,000[3]	[3]
5	[2]	16,000 to 30,000
6	> 20,000[4]	> 30,000[4]

[1] Construction/Reconstruction projects are designed based on a typical 20-year ADT projection beyond the anticipated year of project construction.
[2] Continuous left turn lanes may be considered based on left turn volumes and/or when intersections and/or approaches are closely spaced together.
[3] Undivided sections may be used if left turn movements are low and there is no crash history, otherwise consider installing a median or 5 lane section.
[4] Medians should be used.

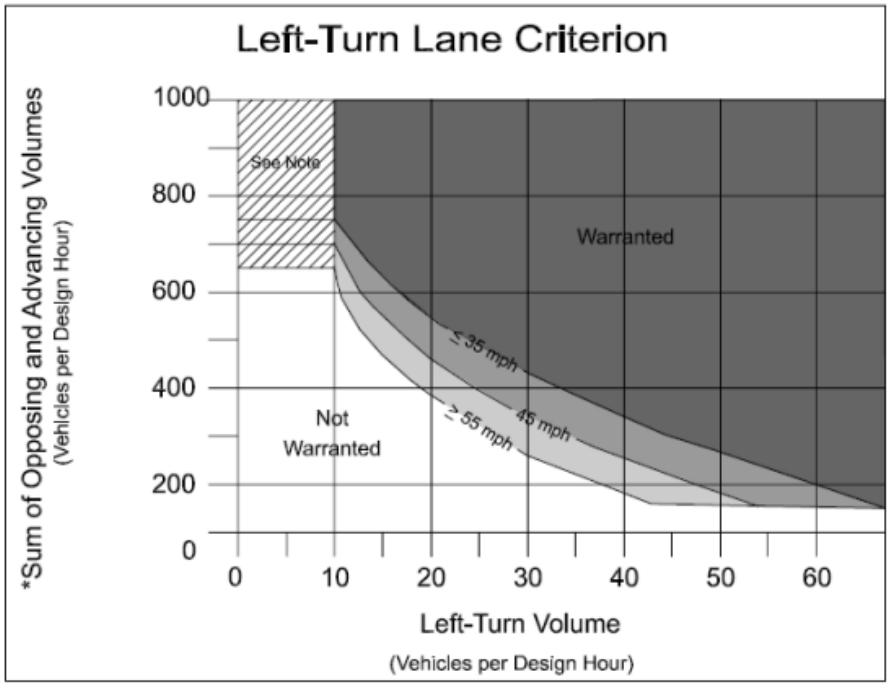
Source: SDDOT Road Design Manual Table 15-9

Figure 3-2: Number of Lanes and Roadway Capacity

Current volumes on Highway 28 are approximately 2,100 vehicles per day west of Highway 15, 1,200 between Highway 15 and Toronto, and less than 600 east of Toronto. While it is anticipated the projected construction workforce will add a notable number of trips related to the current volumes, these additional trips will not be at level high enough to alter the overall LOS for sustained periods of time on Highway 28. This conclusion is applicable to I-29 as well.

The intersection of Highway 28 & 479th Ave / CR 315 will likely be most affected with future travel pattern changes. It is expected that approximately 520 new trips per day, plus delivery vehicles, may be added to the intersection turning movements during peak construction. This equates to approximately 178 vehicles turning left from Highway 28 to northbound 479th Ave / CR 315 during the AM peak hour. During the PM peak hour, these 178 vehicles would turn right from southbound 479th Ave / CR 315 to westbound Highway 28.

The projected eastbound Highway 28 left turn movement traffic was evaluated for left turn lane warrants using SDDOT Road Design Manual guidance left turn lane volume warrants shown in **Figure 3-3**.



Source: Oregon DOT Analysis Procedures Manual 2008

*(Advancing Vol/ # of Advancing Through Lanes)+
(Opposing Vol/ # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Source: SDDOT Road Design Manual Figure 15-2

Figure 3-3: Number of Lanes and Roadway Capacity

A review of the SDDOT turn lane warrants for left and right turn lanes was completed. Assuming a “K” factor of 15%, at most this intersection would have an advancing/opposing volume of 88 (.15 times 582 ADT) vehicles in the peak hour on Highway 28. This is less than the warrant criteria for advancing/opposing vehicles of approximately 100 vehicles per hour and thus could be concluded that a left turn lane is not warranted.

Turn lanes on the stop-controlled approaches are not warranted by operations analysis. While the intersection will be noticeably busier to local users due to the low volumes traveling through the intersection today, it is anticipated to operate within acceptable levels of delay during construction. There may be short periods with increased delay as workers and trucks travel to/from the site, but these periods are expected to be brief and clear quickly.

If concerns arise during construction, the placement of portable message boards along Highway 28 east and west of 479th Ave / CR 315 would help notify local roadway users that volumes are higher than normal due to a nearby construction project. It should be noted that only three months (May 2025-July 2025) are being forecasted with construction workforce more than 200 workers per day. For the other 20 months, the construction workforce is anticipated to be much lower and thus not feasible to construct turn lanes due to the short timeline of need.

4.0 Recommendations for Site Access, Heavy Haul Routes, and Signage

4.1 Site Access

Construction site entrance/exit drive recommendations include:

- Provide for a driveway width of at least 30 feet for a minimum of 300 feet back from the county highway to allow larger trucks to navigate the drive and prepare the approach for the additional site traffic.
- During construction, place truck entering/crossing signs be placed 200 feet to both sides of the project site driveway to alert other construction workforce traffic and local traffic of the increase in truck traffic.

4.2 Heavy Haul Routes

If heavy haul routes are to include gravel roads, the following is recommended:

- Develop a dust control maintenance plan for any haul routes on gravel roads.
- Develop agreements with the township and county, where applicable, for roadway maintenance during construction. The agreement should include how the roadway surface will be maintained in wet and dry conditions and dust will be controlled during construction. The agreement should also clarify township and county roles in snow maintenance during the winter months.
- If any gravel roads are considered for haul routes, a geotechnical engineer should complete an assessment of the gravel depth and structural stability. This assessment will help determine route feasibility and identify additional gravel surfacing, subgrade adjustment, or in-slope flattening needs in preparation for the construction traffic.

Over width and overweight permitting for heavy haulers will be necessary on the state and county facilities and haulers should coordinate as necessary to obtain written permits.

Based on the information provided in this report, bridges on the county or state routes currently allow legal loads and are not posted. Smaller structures and culverts along any construction routes (e.g., CR 315) that are not routinely inspected/load rated should be inspected for condition and any abnormalities prior to starting construction. **Heavy haulers should verify latest pavement and bridge conditions when determining a route.**

4.3 Signage

Implementation of signage for the purposes of routing traffic to the site safely is important and will keep the route defined for those not making daily visits to the site. **Figure 4-1** illustrates a basic signing plan for the construction and delivery vehicles. Additional signage below may be considered:

- On 479th Ave / CR 315, consider installing truck crossing signs 200 feet north and south of the construction access point(s).
- Consider installing YIELD signs on unmarked eastbound and westbound cross-street approaches to 479th Ave / CR 315, if applicable.
- Consider portable message boards on Highway 28 on either side of the 479th Ave / CR 315 intersection.
- All signs placed with state, county, or township right of ways shall meet the requirements of the Manual of Uniform Traffic Control Devices (MUTCD) and shall have the proper breakaway support structures. The signing plan prior to implementation should be approved by the SDDOT Aberdeen Region. Coordinate with Mark Peterson, SDDOT Aberdeen Region Engineer for review and approval.

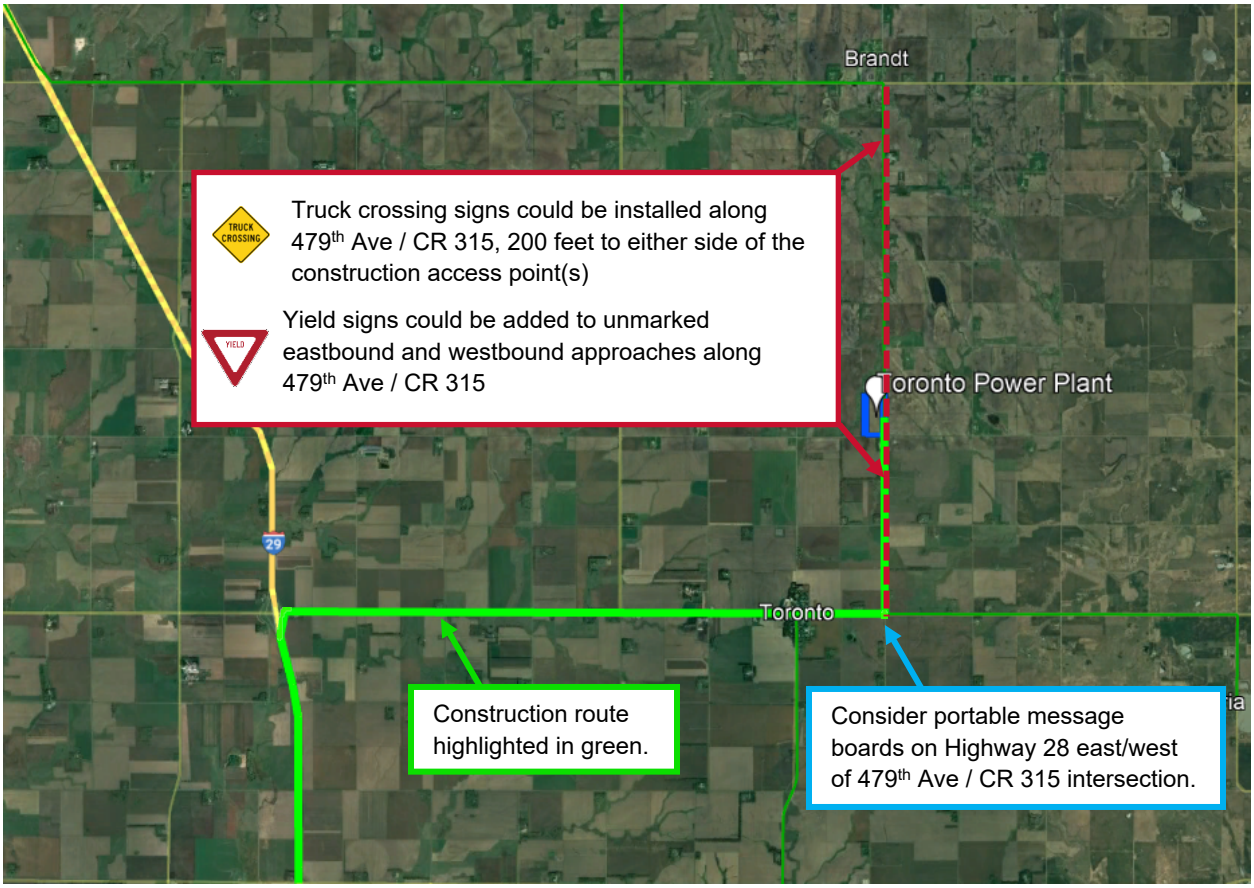


Figure 4-1: Construction Signage Considerations